

**Five-year Review Report**  
(2<sup>nd</sup> Five-year Review Report)  
For  
**Lemberger Landfill and  
Lemberger Transport & Recycling Landfill,  
Franklin Township,  
Manitowoc County, Wisconsin**

**September 2005**

**Prepared by:**

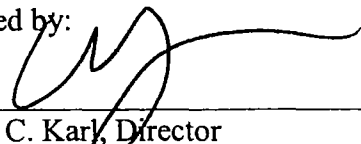
**Wisconsin Department of Natural Resources  
Green Bay, Wisconsin  
For U.S. EPA, Region V**

**EPA Region 5 Records Ctr.**



**244356**

Approved by:

  
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9/21/05

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## **Executive Summary**

The remedies for the Lemberger Landfill (LL) and Lemberger Transport and Recycling (LTR) Landfills in the Town of Franklin, Manitowoc County, Wisconsin were divided into two operable units (OU). The main components of the OU 1 at the LL site were construction of a landfill cap, a slurry wall around the landfill perimeter, a leachate collection system and leachate head monitoring network, passive gas venting, and an extensive groundwater extraction and treatment system. Because it was determined that the conditions at the LTR site warranted emergency removal, an Administrative Order on Consent (AOC) was issued by US EPA requiring an emergency removal action. The removal action consisted of the removal of over 1500 buried drums, jars, and gas cylinders and construction of a composite landfill cap with passive gas venting. Subsequent to the removal action, A No Action Record of Decision (ROD) was issued for the LTR site (OU 2) because it was determined that with the completion of the removal activities, there were no further risks at the site. Construction completion for both OUs was recorded in the fall of 1996. The trigger for this second five-year review date was the signature date of the first five-year review: September 27, 2000.

The assessment of this five-year review found that the remedies were constructed in substantial accordance with the requirements of the ROD and the AOC and that the remedies remain protective of human health in the short term. The immediate threats have been addressed and the remedy is expected to be protective when groundwater cleanup goals are achieved. The remedy is considered protective in the short-term because there is no evidence that there is current exposure.

However, the current pump and treat system has not reduced the size of the plume which exceeds the cleanup levels and it appears possible that natural attenuation rather than active pumping may have removed most of the contamination to date. Therefore, the Agencies have recently approved the site's Potentially Responsible Parties (also known as the Lemberger Site Remediation Group [LSRG]) request to perform an engineering demonstration project to temporarily shut down the pump and treat system and evaluate whether natural attenuation is occurring. US EPA will issue an Explanation of Significant Differences (ESD) to the September 1991 ROD for OU 1 to document the change in the groundwater remedy. The proposed change in remedy includes a 2-year shut down of the pump and treat system, two years of monitored natural attenuation, and an evaluation if natural attenuation is occurring and whether a system shutdown negatively or positively affects the landfill area groundwater regime. In order for the remedy to be protective in the long term, groundwater cleanup goals must be achieved.

In addition, in order to achieve long term protectiveness, institutional controls on the site must be implemented to prohibit on-site development and on-site well installation. Furthermore, WDNR regulations for construction of residential wells in off-site areas surrounding the Lemberger sites must be maintained and enforced.

Residential well sampling will continue to be performed to confirm that residential wells remain safe to use.

## List of Acronyms

<b><i>Acronym</i></b>	<b><i>Definition</i></b>
1,1 DCA	1,1-dichloroethane
1,2 DCE	1,2-dichloroethene
AOC	Administrative Order on Consent
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DNAPL	Dense Nonaqueous Phase Liquids
LSRG	Lemberger Site Remediation Group
MCL	Maximum Contaminant Level
MEK	Methyl Ethyl Ketone
NCP	National Contingency Plan
NPL	National Priorities List
OU	Operable Unit
PAL	Preventive Action Limit
PCB	Polychlorinated Byphenols
PCE	Tetrachloroethylene
PRP	Potentially Responsible Party(ies)
RI/FS	Remedial Investigation/Feasibility Study
RMT	RMT, Inc. - Primary Consultant for LSRG
TCA	1,1,1-trichloroethane
TCE	Trichloroethylene
US EPA	United States Environmental Protection Agency
VOC	Volatile Organic Compounds
WDNR	Wisconsin Department of Natural Resources

## Five-Year Review Summary Form

### SITE IDENTIFICATION

Site name (from WasteLAN): Lemberger Landfill

EPA ID (from WasteLAN): WID 980901243

Region: 5

State: WI

City/County: Town of Franklin/Manitowoc County

### SITE STATUS

NPL status: C Final

Remediation status: Construction Complete -- O & M On-going

Multiple OUs?\* No

Construction completion date: 9/9/96

OU2 – 10/22/96

Has site been put into reuse? NO

### REVIEW STATUS

Lead agency: EPA

Author name: Annette Weissbach

Author title: Project Manager

Author affiliation: WDNR, Northeast Region

Review period:\*\* 5 / 1 / 2005 to 9 / 7 / 2005

Date(s) of site inspection: 8/23/2005

Type of review: Post-SARA Statutory

Review number: Two

Triggering Action

Previous Five-Year Review Report

Triggering action date (from WasteLAN) 9/27/2000

Due date (five years after triggering action date): 9/27/2005

\* "OU" refers to operable unit.]

\*\* [Review period should correspond to the actual start and end dates of the Five-Year Review in WasteLAN.]

**SITE IDENTIFICATION**

Site name (from WasteLAN): Lemberger Transport &amp; Recycling Landfill

EPA ID (from WasteLAN): WID 056247208

Region: 5

State: WI

City/County: Town of Franklin/Manitowoc County

**SITE STATUS**

NPL status: C Final

Remediation status: Construction Complete -- O &amp; M On-going

Multiple OUs?\* No

Construction completion date: 10/22/96

Has site been put into reuse? NO

**REVIEW STATUS**

Lead agency: EPA

Author name: Annette Weissbach

Author title: Project Manager

Author affiliation: WDNR, Northeast Region

Review period:\*\* 5 / 1 / 2005 to 9 / 7 / 2005Date(s) of site inspection: 8/23/2005

Type of review: Post-SARA Statutory

Review number: Two

Triggering Action

Previous Five-Year Review Report

Triggering action date (from WasteLAN) 9/27/2000Due date (five years after triggering action date): 9/27/2005

\* "OU" refers to operable unit.]

\*\* [Review period should correspond to the actual start and end dates of the Five-Year Review In WasteLAN]

## Five-Year Review Summary Form, continued

### Issues:

- 1) Institutional controls: Restrictive covenants have not been filed for the deeds of the LTR and LL properties to prohibit future property development and installation of groundwater drinking wells.
- 2) Groundwater extraction: The extraction system does not appear to have a significant impact on groundwater remediation
- 3) Site maps: Existing site maps do not adequately display surficial features of the LTR site surface. North/South cross section ends in middle of project area.

### Recommendations and Follow-up Actions:

- 1) The LSRG should submit an Institutional Control Plan containing a schedule and milestones for filing restrictive covenants that restrict site development and installation of drinking water wells on LL and LTR facility properties.
- 2) The LSRG will perform a monitored natural attenuation engineering demonstration project to temporarily shut down the pump and treat system and evaluate whether natural attenuation is occurring and also whether a system shutdown negatively or positively affects the landfill area groundwater regime.
- 3) US EPA will issue an Explanation of Significant Differences (ESD) to the September 1991 ROD to document the change in the groundwater remedy. The proposed change in remedy is to:
  - a. Temporarily shut down the pump and treat system,
  - b. Conduct a two year monitored natural attenuation demonstration project, and
  - c. Evaluate if natural attenuation is occurring and whether a system shutdown negatively or positively affects the landfill area groundwater regime.
- 4) LSRG should direct its consultant RMT, Inc, to include appropriate topographical and soil gas monitoring devices on LTR site map and to extend cross section A-A<sup>1</sup> to include "far field plume" and the Branch River.

### Protectiveness Statement(s):

The remedies at the Lemberger Landfill (LL) and Lemberger Transport Sites (LTR) are currently protective of human health and the environment in the short term because the landfill caps, the LL slurry wall, gas vent system, leachate collection system and groundwater pump and treat system continue to function adequately in order to prevent exposure. Access to the site is controlled, and groundwater and nearby residential wells are monitored as required. Groundwater in residential wells within the contaminant plume does not exceed State or Federal drinking water standards. Data indicate predominantly stable concentrations of contaminants in area monitoring wells and leachate head levels in the LL are decreasing.

However, it does not appear that the groundwater cleanup goals will be achieved within the timeframe that was originally anticipated. The current pump and treat system has not reduced

the size of the plume which exceeds the cleanup levels and it appears that natural attenuation rather than active pumping may have removed most of the contamination to date. Therefore, the Agencies have approved the LSRG's request to perform an engineering demonstration project to temporarily shut down the pump and treat system and evaluate whether natural attenuation is occurring. Additionally, institutional controls must still be completed at both sites to prevent site development and installation of drinking water wells.

Long term effectiveness will be achieved at both the LTR and LL sites when ground water cleanup goals have been achieved and the institutional controls are in place.

**Other Comments:**

None.



## **I. Introduction**

### **Purpose of the review**

The purpose of the five-year review is to determine whether the remedy at the site is protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in five-year review reports. Five-Year Review reports identify issues found during the review, if any, and recommendations to address them.

### **Authority for conducting the review**

The Wisconsin Department of Natural Resources (WDNR) is preparing this five-year review pursuant to CERCLA §121 and the National Contingency Plan (NCP). CERCLA §121 states:

*If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review remedial actions no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such a review is required, the results of all such reviews, and any actions taken as a result of such reviews.*

The United States Environmental Protection Agency (US EPA) interpreted this requirement further in the NCP; 40 CFR §300.430(f)(4)(ii) states:

*If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.*

The WDNR has conducted a five-year review of the remedial actions implemented at the Lemberger Landfill (LL) and the Lemberger Transport & Recycling Landfill (LTR) sites in the Town of Franklin, Manitowoc County, Wisconsin. See Figure 1 for an aerial photo of the general site locations. The review was conducted from January 2005 through August 2005. This report documents the results of the review.

This is the second five-year review for these sites. Both the first and second five-year reviews were combined reports due to the proximity of the two sites and the common groundwater problem resulting from the sites. The triggering action for this review is the date of the first five-year review dated September 27, 2000 as shown in US EPA's WasteLAN database. The first review was prepared by US EPA-Region V. The post-SARA (Superfund Amendments and Reauthorization Act of 1986) remedial actions taken at the Lemberger Landfill and the Lemberger Transport & Recycling Landfill sites have left hazardous substances, pollutants, or

contaminants on site above levels that allow for unlimited use and unrestricted exposure. Therefore subsequent five-year reviews are required by statute.

As indicated above, this second five-year review is being completed for both sites.

## II. Site Chronology

Table 1 lists the chronology of events for the Lemberger Landfill and the Lemberger Transport & Recycling Sites.

**Table 1 Chronology of Events**

<i><b>Date</b></i>	<i><b>Lemberger Landfill</b></i>	<i><b>Lemberger Transport &amp; Recycling</b></i>
1980	Initial Discovery of problem	
1982		Initial Discovery of problem
9/84	NPL Listing	
6/86		NPL Listing
9/23/91	RI/FS Complete	
9/23/91	ROD Signature	
7/15/93		Removal Action Start
9/29/94		No Further Action ROD Signature
3/8/95	Remedial Design Complete	
3/8/95	Remedial Action Start	
9/9/96	Remedial Action Complete	
10/22/96		Removal Action Complete
3/17/97	Start operation of Groundwater Treatment System	
1997-6/2003	Semi-annual Operation and Maintenance Reports No. 9 through 13	
9/2000	Five-Year Report	
10/2003	Proposed Revisions to Groundwater Monitoring Program	
3/2004	US EPA & WDNR approval of revised monitoring program	
6/2004	Assessment of Remedial Action Effectiveness	
10/2004	Annual Operation and Maintenance Report #14	
4/2005	Workplan for Field Investigation of Bedrock Characteristics	
8/2005	Workplan for Monitored Natural Attenuation Engineering Demonstration Project	

### **III Background**

#### **Physical characteristics**

The landfills are located within an interlobate glacial moraine geomorphology characterized by alternating and random sequences and deposits of sand, gravel, and clay soils. Overall the sites are underlain by two distinct sand and gravel deposits, referred as the upper granular unit and the lower granular unit and separated by a relatively cohesive clay unit. Dolomitic limestone bedrock of the Niagara Formation lies below the lower granular unit. It is described as a grayish-white massive to thinly bedded sedimentary rock with highly weathered surfaces. In the south portion of the LTR site, outcrops of the bedrock surface are evident. A bedrock ridge trends northeast-southwest near the south portion of the LTR site and the bedrock surface generally slopes to the northwest and southeast away from the ridge.

There are two groundwater systems at the sites. Within the upper granular unit is a localized perched aquifer identified for this project as the Upper Groundwater System (UGS). The second groundwater system consists of a lower aquifer composed of dense sandy gravel and gravely sand which is hydraulically connected with the underlying bedrock. This is known as the Lower Groundwater System (LGS). A groundwater divide exists under the LTR site as a result of a bedrock ridge that causes groundwater downgradient of the sites to flow primarily to the northwest, with a component to the southeast on the southeast side of the LTR site. See Figures 2 for a site plan and cross section locator map, Figure 3 for cross section A-A<sup>1</sup> representing north to south stratigraphy of the sites, and Figure 4 for a groundwater flow map of the September 2003 water table and Piezometric surface.

#### **Land and resource use**

The LL and the LTR Sites are former land disposal facilities located within one quarter mile of each other in Manitowoc County, Wisconsin. Ridgeview Landfill, an active landfill operated by Waste Management Inc., is located east and northeast from the LL site on Hampton Lake Road.

The LL site consisted of about 21 acres which were used for waste disposal, while the LTR site consisted of 16 acres which were used for industrial landfilling. Both sites were unlined and portions of both sites cover areas that contained gravel quarries. Land in the vicinity of the sites is rural and agricultural. Four residences are located within 1000 feet of the sites. The groundwater is used by residents as a drinking water supply and for agricultural purposes.

The Branch River, which drains into Lake Michigan, is located less than one mile west of both sites. The river is used for recreational activities including fishing and canoeing. The Branch River is designated as exceptional resource water and is protected as a Great Lake aquatic community. It is noted for its annual Steelhead trout spawning runs and is managed as a smallmouth bass stream

## **History of contamination**

### Lemberger Landfill

Franklin Township used the Lemberger Landfill (LL) site as an open dump for approximately 30 years (1940-1969). In 1969, the Wisconsin Department of Natural Resources (WDNR) licensed the site as a sanitary landfill, meaning it could receive only municipal waste and power plant fly and bottom ash. Industrial waste was diverted to the nearby Lemberger Transport and Recycling (LTR) site. No leachate collection system was installed at the LL site. Past inspections have shown that fly ash and bottom ash were used as daily cover rather than being buried with general refuse. The quantity of municipal refuse disposed of is unknown and it is also unknown whether or how many hazardous or toxic substances were deposited.

When the license for operation of the LL site expired in 1976, the state required that it be properly closed; however, the state allowed the continued disposal of fly ash to bring the site to final grade. In 1980, following complaints by local residents west of the site that contaminated liquids, or leachate had seeped onto their properties, the WDNR ordered the site owners to conduct an investigation to address contamination problems at the landfill.

### Lemberger Transport & Recycling

The LTR site operated between 1970 and 1976 under the same license issued for the LL site. Prior to using the site for industrial waste disposal, sand, gravel and clay were removed from the top of bedrock. It is reported that the gravel pits covered one sixth of the present LTR area.

The site ceased operations in 1976 when the WDNR did not renew the license. The wastes were deposited in trenches excavated to a depth of approximately 5 feet. Records of the type and quantities of wastes were maintained but no specific records were kept to indicate what types of wastes were deposited in each trench. No engineered liner or leachate collection system were installed at the LTR site. The LTR site is documented as having received industrial and hazardous wastes along with a variety of liquids, sludges and slurries between 1969 and 1977. Industrial wastes, including wood tar distillates, aluminum dust, and oil water mixtures were disposed at the site. It is likely that the so-called oil-water mixtures were wastes from industrial solvent degreasing operations therefore it is estimated that the oil-water mixtures may contain up to 50-65% spent solvents (see Figure 5 for a conceptual site model of VOC sources at the LTR site). In a 1981 inventory of liquid wastes disposed of at the LTR, it was reported that 47,760 gallons of "oil-water mixtures" and 15,895 gallons of paint wastes were bulk dumped into trenches.

The WDNR had expressed concern that the site had not been covered properly, as indicated by wastes exposed at the site surface. Subsequently, in 1982, the WDNR entered into a consent order with the Operator of both sites, Lemberger Landfills Inc., to investigate the extent of contamination at the LTR site. Leachate seeps were occurring as the western edge of the LL site and waste was exposed at the surface of the LTR site.

## Initial Response

A bankruptcy petition filed on behalf of Lemberger Landfill Inc. in 1983 resulted in termination of investigation activities. Subsequently, WDNR recommended to the US EPA that the LL and LTR sites be included on the National Priorities List (NPL). The sites were added to the NPL in September 1984 (LL) and June 1986 (LTR). US EPA became the lead agency responsible for the Remedial Investigation and Feasibility Study (RI/FS) which was performed between 1988 and 1991. Because of the interrelated nature of the two sites, one RI/FS was performed to address both sites.

In 1985, in response to complaints about water quality in area residential wells downgradient of the sites, WDNR sampled several of the wells. Sample results indicated that the groundwater from these wells was contaminated with volatile organic compounds (VOCs) above water quality standards. Between 1985 and 1987, these wells were abandoned and replaced using Wisconsin's Well Compensation Program.

## Basis for taking action

Hazardous substances that have been released at the site as measured during the RI include:

**Table 2 Contaminants of Concern**

	Upper Groundwater System	Lower Groundwater system
Inorganic parameters	Arsenic*	Arsenic*
	Barium*	Barium*
	Chromium	Chromium
Organic parameters	Acetone	1,1 Dichloroethane
	2-butanone	1,1 Dichloroethylene
	1,1 Dichloroethane	1,2 Dichloroethylene
	1,2 Dichloroethylene	1,1,1 Trichloroethane
	Methylene chloride	Trichloroethylene
	MEK	Carbon tetrachloride
	Toluene	Methylene chloride
	Trichloroethylene	Vinyl Chloride
	Xylenes	PCBs

\*also present in background water quality

## Results of the RI included:

The Remedial Investigation (RI) concluded the following regarding contamination from the LL and LTR sites:

### 1.) Source

The source of contamination from the Lemberger sites is the landfilled waste. The volume of waste was estimated to be 479,000 cubic yards. The waste in the LL site is in direct contact with the shallow or perched aquifer and therefore, the waste is in direct contact with laterally moving groundwater. Precipitation is also moving downward through the waste materials in both the LL and LTR sites and is contaminating the groundwater in the deeper bedrock aquifer.

### 2.) Groundwater

Volatile and semi-volatile organic and inorganic contaminants were found in the groundwater at levels exceeding US EPA's drinking water standard Maximum Contaminant Levels (MCLs).

These contaminants included 1,1-dichloroethane (1,1 DCA), trichloroethylene (TCE), 1,2-dichloroethene (1,2 DCE), acetone, toluene, ethylbenzene, xylene, 4-methyl-2-pentanone, chloroethane, 1,1-trichloroethane (TCA), barium, chromium, methylene chloride, 2-butanone and cadmium.

The upper aquifer contained high concentrations (3000-5000 ug/l) of acetone and 2-butanone. Moderate concentrations (100-200 ug/l) of methylene chloride, 1,2 DCE, and tetrachloroethylene (PCE) were detected. Moderate concentrations (100-220 ug/l) of methylene chloride, 1,2 DCE and tetrachloroethylene were detected. Three semivolatile phenols were also identified.

Extensive volatile compounds (greater than 1000 ug/l) were found in the lower aquifer including chloroethane, methylene chloride, 1,1 DCA, 1,2 DCE, and TCA. Phenols, phthalates, pesticides and PCBs were also detected in the lower aquifer. Concentrations in the contaminant plume decreased north of the LTR site and toward the Branch River.

### 3.) Soils

Surface and subsurface soil samples at the LL site contained volatile compounds ranging from 1 to 12 ug/kg (parts per billion) and semivolatile compounds ranging from 71 to 3800 ug/kg. Pesticides including 4,4-DDE, 4,4-DDD, and 4,4-DDT were found at concentrations of 70 ug/kg, 190 ug/kg and 42 ug/kg, respectively.

At the LTR site, surface soils contained volatile organic compounds at concentrations ranging from 230-2000 ug/kg, semivolatile compounds ranging from 94-2000 ug/kg and pesticides including Aldrin at a concentration of 240 ug/kg and Dieldrin at a concentration of 200 ug/kg.

Subsurface soils at the LTR site had lower concentrations of volatile compounds than the surface soils, ranging from 3 to 620 ug/kg. Semivolatiles, pesticides and PCBs were not found in the LTR subsurface soils.

#### **4.) Sediment, Surface Water and Leachate**

Sediment and surface water samples were collected at and near the LL and LTR sites, including the wetland area. Sediment samples showed low concentrations of volatile compounds, however, one sample south of the LL site contained acetone at 510 ug/kg. Surface water samples contained phthalates, methylene chloride and acetone at low levels. Of the four leachate sample locations planned, leachate was found at only one location, in the northwest corner of the LL site. Organics were not detected in this sample

#### **Summary of Site Risks**

Assuming no corrective actions were to be taken, potential exposure to contaminants from these sites can come about through the following potential pathways or routes of exposure:

- Exposure to drinking water through various routes
- Direct contact with or ingestion of contaminated soil by site workers, farmers, hunters, and trespassers
- Indirect exposures to contaminants from ingestion of animals that feed on contaminated crops (current and future)

### **IV. Remedial Actions**

#### **Remedy Selection**

Because of the complex conditions at the LL and LTR sites, the work was divided into two planned activities or operable units (OU). Operable Unit 1 (OU 1) addressed the groundwater contamination resulting from both sites and also the source contamination at the LL site only. Operable Unit 2 (OU 2) addressed the source contamination at the LTR site.

The Record of Decision (ROD) for OU 1 was signed on September 23, 1991. The remedial action objectives were as follows:

- Prevent direct contact, ingestion and inhalation of site related contaminants
- Provide source control of landfill contaminants to prevent further contamination of groundwater
- Restore groundwater to Federal Maximum Contaminants Levels (MCLs) or State of Wisconsin NR 140 Administrative Code Preventive Action Limits (PALs), whichever is more stringent.

The ROD for OU 1 selected the following remedy components to achieve the remedial action objectives:

- Installation of extraction wells and a groundwater treatment system to restore groundwater in the upper and lower aquifers.
- Construction of a Subtitle D landfill cap per State of Wisconsin landfill closure regulations for the LL site.
- Construction of a slurry wall around the perimeter of the LL site.
- Installation of leachate withdrawal wells in the interior of the LL site and a leachate storage system with transport of leachate to a Publicly Owned Treatment Plant (POTW).
- Construction of an outfall pipe from the on-site groundwater treatment plant with final discharge to the Branch River.

A source control action for the LTR site (OU 2) was not included in the September 23, 1991 ROD because further characterization was required. It was found that the LTR site contained buried drums as well as landfill hotspots.

After performing further investigation, US EPA and WDNR determined that conditions at the LTR site warranted emergency removal actions to abate conditions that may have presented an imminent and substantial endangerment to the public. On July 15, 1993, US EPA signed an administrative order on consent (AOC) with the potentially responsible parties to perform removal activities at the site. Removal activities required by the order included:

- Construct a site fence around the perimeter of the LTR site.
- Excavate and dispose of drums.
- Use soil vapor extraction to treat contaminated soils adjacent to the drums and identified landfill hotspots.
- Submit a workplan to install a vapor extraction system for further source removal and also, at a minimum, a Subtitle D landfill cap per State of Wisconsin landfill closure regulations.

On September 29, 1994, US EPA subsequently issued a ROD for the LTR site source control (OU 2) which recommended no further action at the site, because it was determined that once all removal activities required by the administrative order on consent were completed; there would be no further risk at the site.



## Remedy Implementation

The PRP group, the Lemberger Site Remediation Group (LSRG), entered into a Consent Decree with US EPA and WDNR in 1992 to undertake remedial activities at the Lemberger sites. Remedial design for OU 1 was completed in March 1995. The main components of the OU 1 remedial action were construction of the landfill cap at the LL site and the groundwater extraction and treatment system.

The construction of the landfill cap portion of the remedial action began in July 1995. The landfill cap is composed of the following layers from ground surface downward: a vegetative layer, a cover soil layer, a geotextile layer separating the cover soil layer and a sand drainage layer, the sand drainage layer to transmit water collected above the clay barrier layer, the clay barrier layer, a second geotextile layer, a sand gas control and foundation layer and a prepared subgrade. A gas venting system consisting of gas vents and slotted risers connects into the gas control and foundation layer which lies below the clay barrier.

Approximately 44,000 cubic yards of solid waste were also relocated from the fringes of the landfill into designated areas within the landfill. A slurry wall was constructed around the landfill perimeter and keyed 3 feet into the underlying clay layer, whenever the clay layer was present. A leachate collection system was also constructed at the landfill with leachate collection wells and piping located just inside the slurry wall. The leachate system consists of a number of leachate/groundwater extraction wells and leachate head wells which measure the height of leachate/groundwater present in the landfill. The landfill cap and its associated components were completed in August 1996.

Construction of the groundwater extraction and treatment system began in 1996. The extraction wells were installed in both the UGS and LGS systems. Ground water quality is evaluated through a network of monitoring wells and residential wells. Observation wells were installed to assess the hydraulic effectiveness of the extraction wells. The extraction wells discharge to an air stripper type treatment facility. Effluent from the treatment facility is discharged to the Branch River and effluent quality is required to meet limits contained in the facility's Wisconsin Discharge Elimination System (WPDES) permit. Leachate storage tanks are also located at the treatment facility to receive leachate from the landfill leachate collection system. Leachate is trucked off-site for treatment and disposal.

A prefinal inspection was conducted for OU 1 on August 27, 1996, and a list of outstanding items was developed. The final inspection conducted on September 25, 1996, found that these items had been substantially completed. A Preliminary Closeout Report documenting construction completion for OU 1 was signed on September 9, 1996.

Removal activities, pursuant to the July 15, 1993 Administrative Order on Consent (AOC) for OU 2, started in August 1993. A work plan for the excavation and removal of drums from the LTR site was approved by US EPA in November 1993. On November 23, 1993, field activities related to the excavation and removal of the drums started. The excavation and classification of the drums was completed in April 1994. A total of 1380 drums were excavated and put into overpack drums. In addition, 180 laboratory-type jars and 226 gas cylinders were found during

excavation activities. All drums, laboratory jars and cylinders were disposed of in an US EPA approved facility.

Finally, as part of the AOC for OU 2, the LSRG submitted a workplan for the design and construction of a soil vapor extraction system and a Subtitle D landfill cap. Prior to construction it was determined that the soil vapor cap would not be effective in removing VOCs from the source and therefore the soil vapor extraction system was not constructed. As an alternative remedy, US EPA required a composite landfill cover be constructed. In order to provide a similar level of protection, the composite landfill cover was selected to provide for a greater reduction of infiltration through the source materials than would be afforded by a Subtitle D landfill cap that would have been constructed as part of the soil vapor extraction remedy. A prefinal inspection was conducted on OU 2 in October 1996. A Preliminary Closeout Report for OU 2 was signed on October 22, 1996.

### **System Operations/Operation and Maintenance (O&M)**

**Table 3: Annual System Operations/O&M Costs**

<b>Year</b>	<b>Total costs (incurred by LSRG through contract with RMT)</b>
2000	535,000
2001	514,000
2002	569,000
2003	554,000
2004	448,000
Through July 2005	309,000

### **O&M summary**

General operation and maintenance (O&M) work accomplished during this five-year review period from 2000 to 2005, included routine maintenance of building and treatment system, road repairs, mowing, water and gas monitoring, sample collection, etc.

Other types of O&M costs not included in Table 4 have been incurred by the LSRG including:

- O&M management services provided by Attorney Doug Clark, of Foley & Lardner, the law firm representing the LSRG in providing legal services and general site management.
- Compensation to property owners for access, easements, and/or land use restrictions.
- Compensation to property owners for property repairs, damaged crops, etc. required due to remediation system upgrades or maintenance.
- Suppliers or contractors required for O&M tasks other than suppliers/contractors provided through arrangements made by RMT.

Until 2003, O&M Reports were submitted on a semi-annual basis. As a result of revisions made to the groundwater monitoring program, approved by US EPA and WDNR in March 2004,

Progress Report #14, covering the period from July 2003 to June 2004, became the first of continuing annual O&M reports.

## V. Progress since the last review

Status of recommendations and follow-up actions from last review (see Table 4)

The following deficiencies were noted during the last five-year review and site visit.

**Table 4: Actions taken since the last five-year review**

Issues from previous review	Recommendations/ Follow-up actions	Party Responsible	Action taken and Outcome	Date of Action
Groundwater Pumping System	Begin construction of pumping system modifications	LSRG	Addition of new extraction wells did not effect increased contaminant reduction	October & November 2001
Leachate Head Wells	Implement recommendations of report for leachate level reduction	LSRG	Wells rehabilitated, screens flushed	2003
Extraction well 4I temporarily out of operation	Replace pump	LSRG	Pump replaced	October 2000
Damaged fence panel	Repair fence	LSRG	Fence repaired	October 2000
Sampling of extraction wells in treatment plant and not at well head	Perform sampling at well head	LSRG	Alternating sampling at well head twice/year summer months and at treatment building during winter months	September 2000
Deteriorated surface seals at RM-4 and RM-5 well nests	Repair concrete	LSRG	Surface seals repaired	Fall 2001

## VI. Five-year Review Process

### Administrative components

The Lemberger sites five-year review was prepared by Annette Weissbach, Hydrogeologist, WDNR Project Manager. Darryl Owens, US EPA Remedial Project Manager assisted in the review. The five-year review consisted of the following activities: a review of relevant documents (see Table 5), interviews with LSRG's consultants, RMT Inc., interviews with treatment system operations personnel and a site inspection. The completed report will be available in the information repository. Notice of its completion will be placed in the local newspaper and local contacts will be notified by letter.

**Table 5: Relevant Documents**

Date	Title
2001-2003	Semi-Annual O&M Reports 9-13
June 2003 –June 2004	Annual O&M Progress Report 14
October 2003	Proposed Revisions to Groundwater Monitoring Program
June 2004	Assessment of Remedial Action Effectiveness

### **Data review**

### **Private well Monitoring**

The private well sampling varies between two groups designated as Group 1 and Group 2. There are six private residences being served by Group 1 wells and they are sampled quarterly for VOCs. Only one of the wells, GR-13, appears to have a consistent measured presence of 1,1-DCA usually at less than 1 ug/L. The Wisconsin NR 140 drinking water standard for 1,1-DCA is 850 ug/L.

There are 17 private wells in Group 2 and they are sampled annually for VOCs. No detects of contaminants of concern have been detected in the Group 2 wells since the last five-year review.

A report titled *Proposed Revisions to Groundwater Monitoring Program* was submitted to US EPA and WDNR in October 2003 in which LSRG recommended a number of changes in the monitoring frequency. After review and comments from US EPA and WDNR, LSRG submitted an amended report in March 2004, which was subsequently approved and implemented.

### **Groundwater Monitoring**

The overall groundwater monitoring is discussed in greater detail in Sections VII and VIII below.

### **Landfill gas monitoring**

The Gas vents at the LL site are passive and are not monitored.

The Gas vents (on-site) and gas probes (adjacent to disposal area) at the LTR site are monitored yearly. After the November 2003 landfill gas monitoring event, LSRG requested a reduction in the landfill gas monitoring frequency from semiannual to annual. This was subsequently granted by US EPA and WDNR as occurrences of methane detection have been limited or non existent. In November 2003, landfill gas monitoring was conducted for methane, oxygen, nonmethane VOCs and gas velocity. No detections of nonmethane VOCs or methane was measured in the LTR gas vents and gas probes. The next gas monitoring event is scheduled for September 2005.

## **Branch River toxicity sampling**

The Branch River is the receiving water body of treated effluent from the groundwater treatment plant for the Lemberger sites. To minimize potential impacts on the Branch River ecosystem, the treatment facility is required to meet discharge limits established by the WDNR. Surface water, sediment, and macro invertebrate samples were also collected as part of the Branch River Ecological Monitoring Program conducted during the first three years of the treatment system operation. The monitoring program was designed to assess chemical and biological changes in the water quality, river sediments, and benthic macro invertebrates during the first three years of operation of the groundwater treatment system. No adverse effects were found during the three year monitoring program.

Continued annual acute and chronic toxicity test batteries (fathead minnow, *ceriodaphnia dubia*) are performed on treated effluent during the fall of every year and the most recent results were reported in December 2004. All tests results have been toxicity negative (acute LC<sub>50</sub>'s and chronic IC<sub>25</sub>'s greater than 100% effluent). Based on the sampling conducted since the first five-year review, the effluent discharge has not affected the water quality and/or aquatic life community in the Branch River.

## **Groundwater Pump & Treat System**

There are nine extraction wells and four sumps operating in the system to date. The original system constructed in 1996 included six extraction wells and four groundwater extraction sumps.

In 2001, after performing contaminant-transport modeling in an attempt to upgrade the system, three additional extraction wells were constructed along the northern edge of the LTR site, and one extraction well was constructed at the southwestern corner of the LL site. One of the original wells constructed in 1996, EW-5I was shut down as part of the system upgrade.

Since the first five-year report, average flow rates of the four extraction wells (EW-1, EW-6, EW-8, and EW-9) near the LTR site range between 0.16 and 1.1 gallons per minute (gpm). One extraction well (EW-7) near the LL site has a discharge flow rate of 20.4 gpm. The four new extraction wells installed in 2001 (EW-6 through EW-9), have much lower flow yields than expected. However, significant VOC concentrations are being measured during monitoring events, indicating that the new wells are having an impact on VOC mass removal rate.

The wells located hundreds to thousands of feet away from the landfills (EW-2D, EW-3D, EW-4D, EW-4I), exhibit average discharge flow rates of 44, 60, 12.4, and 77 gpm respectively. See Figure 2 for locations of the extractions wells.

The total groundwater volume pumped and treated between March 1997 and June 2004 was 804,318,180 gallons. Flow rate varies considerably from well to well. The average Trichloroethylene mass removed is estimated at 4.08 grams per day. The most recent Annual O&M Progress Report for the period July 2003 through June 2004, indicated that TCE, TCA, 1,1 DCA, 1,2 DCE, and 1,1 DCE continue to be the most commonly found VOCs at elevated

concentrations. Graphs included in the Report show that VOC concentrations in all extraction wells are generally stable with no obvious decreasing or increasing trends.

### **LL site dewatering**

Eight leachate/groundwater withdrawal wells inside the slurry wall continue to operate at nearly 100% capacity since 2000. Nine head wells that measure leachate head elevations continue to be monitored. In general, head levels decreased by less than one foot in most wells during the last reporting period (July 2003-June 2004).

By June 2004, Monitoring data showed that head levels beneath the southern half of the LL site have reached the target level of 1 foot above the clay layer. In the northern half of the LL site, a marked decrease in head levels in the remaining groundwater “pool” has not been seen despite a November 2003 effort to rehabilitate the leachate withdrawal wells. Rehabilitation included flushing of solids that had accumulated around the screens. Upon rehabilitation, total leachate volume produced increased by 62% in the subsequent 2-week period, however, the head levels did not decrease in a corresponding manner with the increased removal of leachate volume. Gallons removed averaged ~60,000 gallons per month in 2004.

In March 2002, proposed head level targets, schedule, evaluation procedures, and contingency measures were included in O&M Progress Report #10. For those wells that have not met their target goal (one foot above the clay layer), evaluation of head reduction is made using linear regression analysis and showing a projected date to reach the target level. If the projected date to reach a target level, increases by more than 30% from one O&M Progress Report to the next, a workplan is to be submitted to evaluate remedial options to improve dewatering.

### **Community Notification**

A public notice for both sites was placed in the Manitowoc Harold Times on July 14, 2005. No comments were received as a result of the notice.

### **Site inspection**

The site inspection was completed during the morning hours of August 23, 2005. Temperatures were in the low 60s, skies were overcast, and a light drizzle was falling. In attendance were Mark Brooks, the on-site Landfill Operator from RMT, Inc., the consulting firm hired by the LSRG to conduct the site O&M, and Annette Weissbach, WDNR Project Manager. Site photographs were taken and the five-year review site inspection checklist was completed (see Appendix 2). In general, the landfills, fencing, and on site buildings were in very good shape. WDNR has not received any complaints from nearby neighbors in the last five years.

On-site documents and records were verified. Documents not routinely submitted to WDNR Project Manager were reviewed. O&M costs are provided in Table 4 above.

Site access is secured by six foot, locked chain link fencing that is checked periodically and during routine monitoring. Signs are posted at gate openings along public roadways. Daily logs of building checks are maintained. The treatment building has an alarm system.

The landfill covers and side slopes were in excellent shape, no erosion, holes, cracks, or low spots were observed. More soil fill and seeding had been added to some of the side slopes of the LL in 2003. 2005 has been a very dry summer; the cover had been mowed in May but by August the vegetation was still rather short. Another mowing is scheduled for September.

Surface water collection berms and swales are obvious undulating features on the landfill covers. The outflows were lined with riprap and small dolostone rocks. Parts of these areas had been enhanced in the last several years to prevent erosion. The drainage features are very adequate for typical rain/spring thaw events in Wisconsin. Some of the drainage features had several rather large weedy trees and excessive vegetative growth that is planned for removal this fall.

The Gas vents at the LL site are passive and are not monitored. The Gas vents (on-site) and gas probes (adjacent to disposal area) are monitored yearly at the LTR site.

The eight leachate extraction wells at the LL site have float activated pumps and were functioning as designed. Approximately two loads (7000 gallons each) are trucked off site each week to the *Heart of the Valley* Metropolitan Sewerage District in Kaukauna, Wisconsin. Leachate storage capacity at the site is 30,000 gallons.

Groundwater extraction system was functioning as designed with a six-tank air stripper (aeration tanks). Extracted groundwater flows to a collection tank and then to one of three tandem aeration tanks (primary and polishing tank). Retention time is estimated at 2-3 minutes with a total flow rate of approximately 200 gallons per minute. Individual extraction well flow rates at time of the inspection were as follows:

EW-1D	3 gallons per minute (GPM)
EW-2D	42 gpm
EW-7D	7 gpm
EW-4I	~76 gpm (new meter- likely incorrect, was reading 83 gpm)
EW-3D	54
EW-4D	13
GWC	0

Extraction wells EW-6, EW-8, and EW-9 have pneumatic water pumps that discharge to wet well 101, which periodically discharges to the treatment system.

During the walkover of the LTR site, it was noted that the LTR site map routinely submitted with the O&M Progress Reports and other submittals lacks detail of surficial features. The LL site maps tend to reflect side slopes and overall shape of the capped area.

### **Interviews**

No interviews were conducted.

## VII. Technical Assessment

The LSRG submitted a report titled *Assessment of Remedial Action Effectiveness, (Effectiveness Report)* in June 2004, which evaluated the effectiveness of the original as well as the “enhanced” groundwater extraction system. This report concluded that the newly installed extraction wells along the northern edge of the LTR site and the southwestern corner of the Lemberger Landfill are not effective in intercepting and removing the Volatile Organic Contaminant (VOC) source materials and that the overall enhanced system has resulted in limited improvement of the system effectiveness. The report describes the effectiveness of the groundwater remedy in terms of VOC concentrations within about 100 feet of the landfills (landfill area plume), and then beyond to several thousand feet downgradient (far field plume).

The Effectiveness Report states that VOC contaminant concentrations in the far-field Plume have generally reached equilibrium conditions with some VOCs remaining above cleanup standards. However, a data review of the total contaminant concentrations indicates that some wells are showing obvious downward trends in overall contaminant concentrations (RM-2D, RM-204I, RM-204D, and RM-208D). The report further states that contaminant concentrations in monitoring wells near the LTR site do not show any decreasing trends in VOC concentrations. In fact a review of the data shows that bedrock well RM-7XD is experiencing a dramatic increase in total VOCs, and Well RM-7D is showing moderate increases in total VOCs. Well RM-8D, located between the LL and LTR site is displaying a slight decreasing trend. Refer to Appendix 1 for Tables showing Mann-Kendall Statistical Tests. While the test generally is used for petroleum contaminants, it can also be applied to VOCs.

The groundwater quality of residential wells within the contaminant plume has not exceeded State or Federal drinking water standards.

The Effectiveness Report also analyzed the historic disposal practices at the LTR site and concluded that there is likely to be Dense Nonaqueous Phase Liquid (DNAPL) source materials located beneath the LTR site. Liquid industrial wastes were bulk-dumped into shallow trenches in multiple areas at the LTR site. When excavating the trenches, the clay layer was typically breached which allowed the liquid wastes to rapidly infiltrate into the lower granular unit and bedrock aquifers below. DNAPLs are recognized to be persistent sources of contamination which are very difficult to remove and can significantly extend cleanup times.

The Effectiveness Report also noted the fractured nature of the bedrock aquifer which also increases the difficulty of cleanup through groundwater extraction. Fractured bedrock has reduced hydraulic conductivity which makes pumping difficult. Where DNAPL is present, it tends to migrate into fractures and either remains there or slowly diffuses into the rock matrix, both of which make cleanup difficult. It was calculated that in the fractured rock network at the sites, DNAPL diffusion from the fractures into the bedrock matrix is occurring, and may continue for many years, potentially decades. See Figure 5 for a Conceptual Site Model of VOC Sources.



The Effectiveness Report included several new cross sections which were a vast improvement over previous maps. However, Cross Section A-A1 (see Figures 2 and 5) should be expanded to the north to include additional groundwater pumping wells and the Branch River.

**Question A: Is the remedy functioning as intended?**

**NO**

Based on review of the data of the seven to eight years since the groundwater pump and treat system started, it doesn't appear as though the groundwater clean up goals will be achieved by 2013 (16 years from start up) as had been estimated in the ROD. The extent of the plume above cleanup goals has not changed appreciably in extent or degree, in fact, the TCE "hot spot" contamination extent appears to be expanding (see Figure 6 – TCE Isoconcentrations March 2000/September 2003). Some of the monitoring wells are showing decreasing contaminant trends while others near the LTR show increasing contaminant trends, especially with respect to parent VOC compounds (TCE, PCE, TCA). It appears that contaminants in many of the wells are at equilibrium with the natural groundwater regime and are not being impacted by pumping.

Furthermore, the Effectiveness Report concluded that the current groundwater extraction system only removes about 5 percent of the total dissolved VOC contamination, while about 90 percent of the contamination appears to be removed by natural attenuation processes, primarily biodegradation. The Effectiveness Report concluded that 5% of the groundwater flowing from the LL and LTR discharges directly to the Branch River.

However, the site fencing and the LL and LTR caps are effective remedies to prevent direct contact and ingestion of contaminated soil. The LL slurry wall and leachate head reduction are valid source control measures and appear to be nearing the goal of reducing head levels to one foot above the clay layer. Further, the groundwater in residential wells within the contaminant plume has not exceeded State or Federal drinking water standards.

The ROD calls for institutional controls to prevent exposure to contaminants on the site. The proposed institutional controls were to prohibit soil excavation and on-site well installation for consumption of groundwater. The Scope of Work in the Consent Decree for the site, requires the Settling Defendants to effectuate institutional controls including deed restrictions for all of the facility property which any of them own to prohibit future development at the LL and LTR Facilities and to prohibit installation of ground water drinking supplies. The Consent Decree also requires the Settling Defendants to use their best efforts to implement these same deed restrictions on those portions of the facility property which are owned by persons other than the Settling Defendants.

After consulting with LSRG, it was determined that restrictive covenants have never been placed on the deeds for the LL and LTR facility properties. At the present time, lack of a deed restriction is not a human health concern as the ongoing remedy at the site and its listing on the NPL limits use of the property. The LSRG does not own the LL and LTR properties. The LSRG has indicated to U.S. EPA its willingness to work to get the site property owner(s) to file

the necessary restrictive covenants with the Manitowoc County, Wisconsin Register of Deeds. The LSRG should develop an Institutional Control Plan which will specify necessary actions and a schedule for implementation of the land use restrictions.

NR 812, Wis. Adm. Code, an applicable or relevant and appropriate requirement (ARAR) is also an institutional control for off-site properties and does not allow drinking water wells within 1200 feet of a landfill, without a variance. Issuance of the variance includes a hydrogeologic review of the setting and frequently requires minimum casing lengths and special well construction. These requirements serve to protect potential human receptors of contaminated groundwater. In addition, WDNR has identified *Special Casing Depth Areas* numbers 18 and 19, for Townships 20 North and Range 22 East surrounding the Lemberger landfills that require 250' minimum casing lengths and WDNR approval for all construction/reconstruction of drinking water wells.

**Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of remedy still valid?**

**YES**

There have been no changes in standards and TBCs since the first five-year review. Exposure pathways have not changed; there is still a threat to groundwater. Due to the toxicity and other contaminant characteristics, the cleanup standards identified in NR 140 Wisconsin Administrative Code PALs are still appropriate.

#### **Changes in Chemical Specific Standards**

Numerous changes in chemical specific standards occurred prior to the first five-year review and were discussed in detail in the September 2000 report. U.S. EPA did not see a need to adopt the current PALs as clean up standards at that time and determined that the remedy remained protective under the existing site cleanup standards.

#### **Changes in Action and Location Specific Requirements**

The action specific and location specific State of Wisconsin applicable or relevant and appropriate requirements (ARARs) for landfill construction have not changed since the signing of the ROD.

**Question C: Has any other information come to light that could call into question the protectiveness of the remedy?**

**YES**

It is likely that the LL and LTR capping, LTR source removal (drum excavation), and LL leachate head reduction have had a greater positive impact on the reduction of contaminants in the environment than the groundwater pump and treat system.

From review of the data, it appears that the receptors (drinking water supply wells and the Branch River) are protected. However, new information discussed in the Effectiveness Report questions the effectiveness of the groundwater pump and treat remedy.

The LSRG has recently submitted a ***Workplan for Monitored Natural Attenuation***. As indicated earlier, LSRG has concluded that 90% of the VOC mass is being naturally attenuated and 5% is discharging to the Branch River, meaning that the groundwater pump and treat remedy is only 5% effective. LSRG requested approval to temporarily shut down the pump and treat system and conduct a two year monitored natural attenuation demonstration project to evaluate if natural attenuation is occurring and whether a system shutdown negatively or positively affects the landfill area groundwater regime. In April 2005, the Agencies concurred with LSRG's request to perform the demonstration project. U.S. EPA will be issuing an Explanation of Significant Differences (ESD) to the September 1991 ROD to document the change in remedy.

During the demonstration project, the continued protectiveness of residential well drinking water will be closely monitored. There are 23 residential drinking water wells within the flow path of the contaminant plume. Monitoring of residential wells will continue at the current quarterly monitoring frequency for Residential Well Group I. The monitoring frequency for Residential Well Group II will be increased from an annual basis to a quarterly basis during the first year of the study and semi-annually (twice a year) for the second year of the study. There are also eight existing monitoring wells which are called sentinel wells because they are located in the vicinity of some of the residential wells. Monitoring groundwater quality in the sentinel wells provides advance notice of any contaminants approaching these residential wells. The sentinel wells will also be monitored on a quarterly basis.

### **Technical Assessment Summary**

The groundwater pump and treat remedy appears to have had minimal affect on the progress of achieving the groundwater cleanup goals and thus the groundwater cleanup remedy is not functioning as intended. The exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of remedy are still valid. It is likely that the LL and LTR capping, LTR source removal (drum excavation), and LL leachate head reduction have had a greater positive impact on the reduction of contaminants in the environment than the groundwater pump and treat system.

The June 2004 *Report on the Assessment of the Remedial Action Effectiveness* calls into question the effectiveness of the remedy. It appears to indicate that the source control remedies (capping, drum excavation and leachate head reduction) may be sufficiently protective while natural groundwater attenuation with groundwater monitoring may be just as protective as the current active groundwater pump and treat system. A monitored natural attenuation demonstration project will be performed over a two year period to evaluate whether natural attenuation is occurring and whether shut down of the groundwater pump and treat system negatively affects the landfill area groundwater flow regime.

## VIII. Issues

Issues that were identified during the site inspection, technical assessment, and other five-year review activities are summarized in the tables below.

**Table 6: Issues**

Issues	Affects current protectiveness (Y/N)	Affects future protectiveness (Y/N)
Institutional controls: Restrictive covenants have not been filed for the deeds of the LTR and LL properties to prohibit future property development and installation of groundwater drinking wells.	N	Y
Groundwater extraction: The extraction system does not appear to have a significant impact on groundwater remediation	N	Unknown
Site maps: Existing site maps do not adequately display surficial features of the LTR site surface. North/South cross section ends in middle of project area	N	N

## IX. Recommendations for Follow-up Actions

**Table 7: Recommendations and Follow-up Actions**

Issue	Recommendations And Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness (Y/N)	
					Current	Future
Institutional Controls	The LSRG should submit an Institutional Control Plan containing a schedule and milestones for filing restrictive covenants prohibiting site development and installation of drinking water wells on LL and LTR facility properties.	LSRG/ Property Owners	US EPA/ WDNR	March 2006	N	Y
Groundwater Remedy	Issue an ESD to the LL ROD	US EPA	N/A	2005	N/A	N/A
Groundwater Remedy	Conduct a monitored natural attenuation demonstration project	LSRG	US EPA/ WDNR	2008	N	N
Site maps	-Include appropriate topographical and soil gas monitoring devices on LTR site map -extend cross section A-A <sup>1</sup> to include "far field plume" and Branch River	LSRG	US EPA/ WDNR	2006	N	N

## X. Protectiveness Statement(s)

The remedies at the Lemberger Landfill (LL) and Lemberger Transport Sites (LTR) are currently protective of human health and the environment in the short term because the landfill caps, the LL slurry wall, gas vent system, leachate collection system and groundwater pump and treat system continue to function adequately in order to prevent exposure. Access to the site is controlled, and groundwater and nearby residential wells are monitored as required. Groundwater in residential wells within the contaminant plume do not exceed State or Federal drinking water standards. Data indicate predominantly stable concentrations of contaminants in area monitoring wells and leachate head levels in the LL are decreasing.

However, it does not appear that the groundwater cleanup goals will be achieved within the timeframe that was originally anticipated. The current pump and treat system has not reduced the size of the plume which exceeds the cleanup levels and it appears that natural attenuation rather than active pumping may have removed most of the contamination to date. Therefore, the Agencies have approved the LSRG's request to perform an engineering demonstration project to temporarily shut down the pump and treat system and evaluate whether natural attenuation is occurring and what the impact is on the groundwater contaminant plume. Additionally, institutional controls must still be completed at both sites to prevent site development and installation of drinking water wells.

Long term effectiveness will be achieved at both the LTR and LL sites when ground water cleanup goals have been achieved and the institutional controls are in place.

## **XI. Next Review**

Hazardous substances, pollutants, or contaminants will remain at the sites that will not allow for unlimited use or unrestricted exposure. US EPA or the WDNR, if delegated to do so by U.S. EPA, will conduct another Five-Year Review five years from the date of this Review.

## **Attachments**

Figure 1	Regional Site Location Air photo
Figure 2	Site Plan and Cross Section Locator Map
Figure 3	Cross Section A-A <sup>1</sup>
Figure 4	Groundwater Flow Map: September 2003
Figure 5	Conceptual Site Model of VOC Sources
Figure 6	TCE Isoconcentrations in Bedrock Aquifer: March 2000, September 2003

## **Appendices**

1. WDNR Form 4400-215 Mann Kendall Statistical Tests for monitoring wells RM-2D, 5D, 7D, 7DX, 8D, 204I, 204D, 303D, 306D
2. Site Inspection Checklist and Photographs

# Lemberger Landfill Superfund Site

## 1) State



## 2) Manitowoc County



## 3) Lemberger Landfill

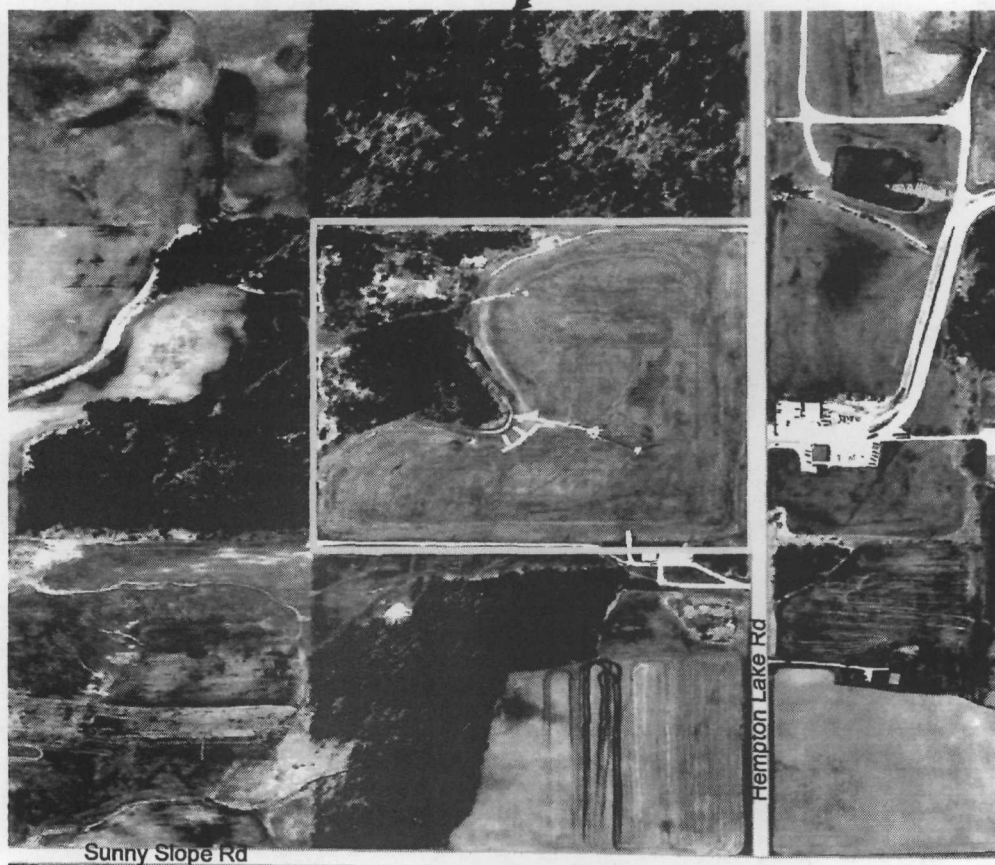


Figure 1



# Lemberger Transport and Recycling Superfund Site

## 1) State



## 2) Manitowoc County

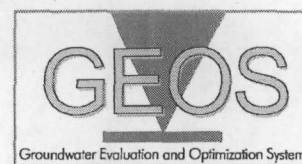


## 3) Lemberger Transport and Recycling



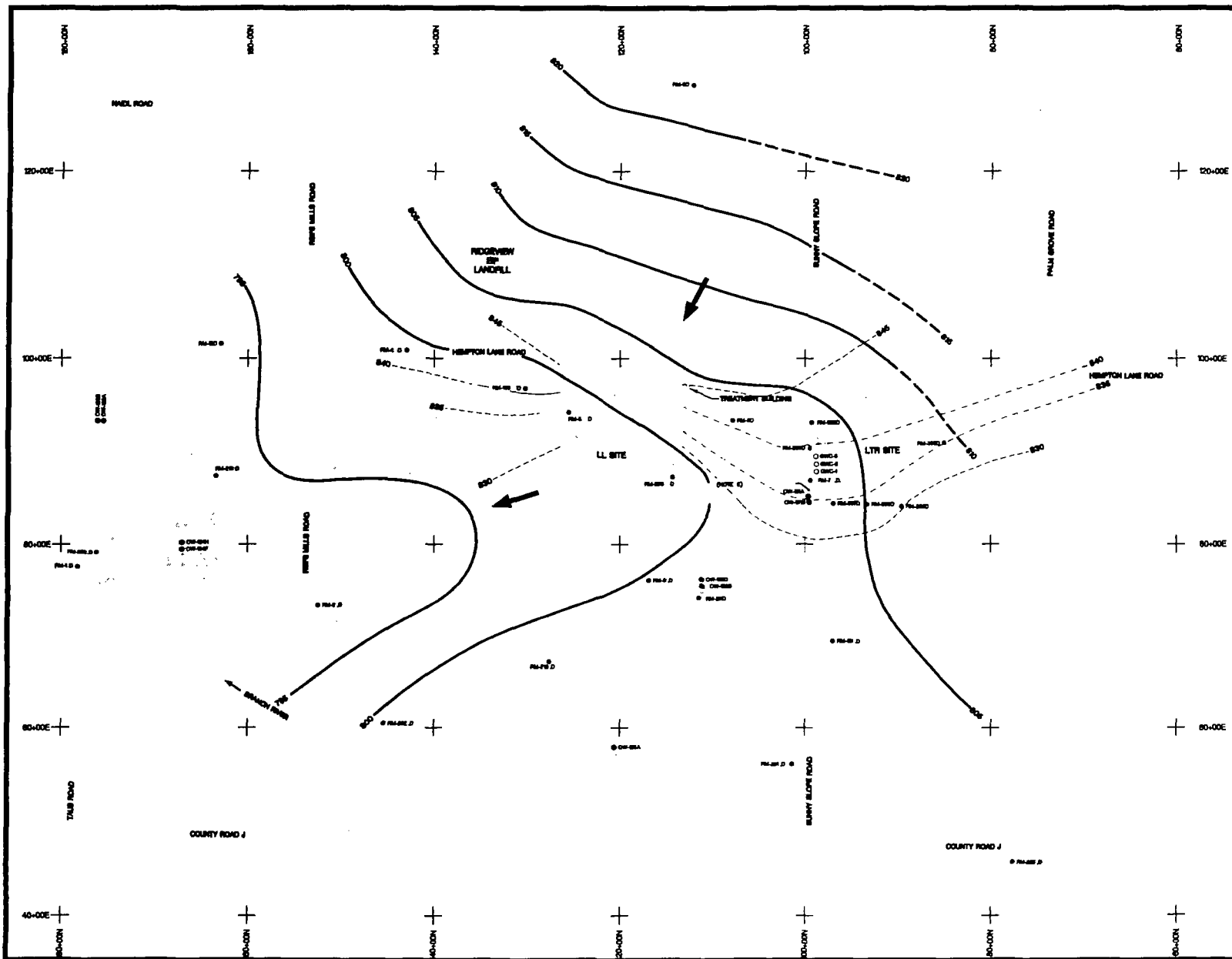
Figure 1

Plot created by Sarah Backhouse U.S. EPA Region 5 on 9/12/2005







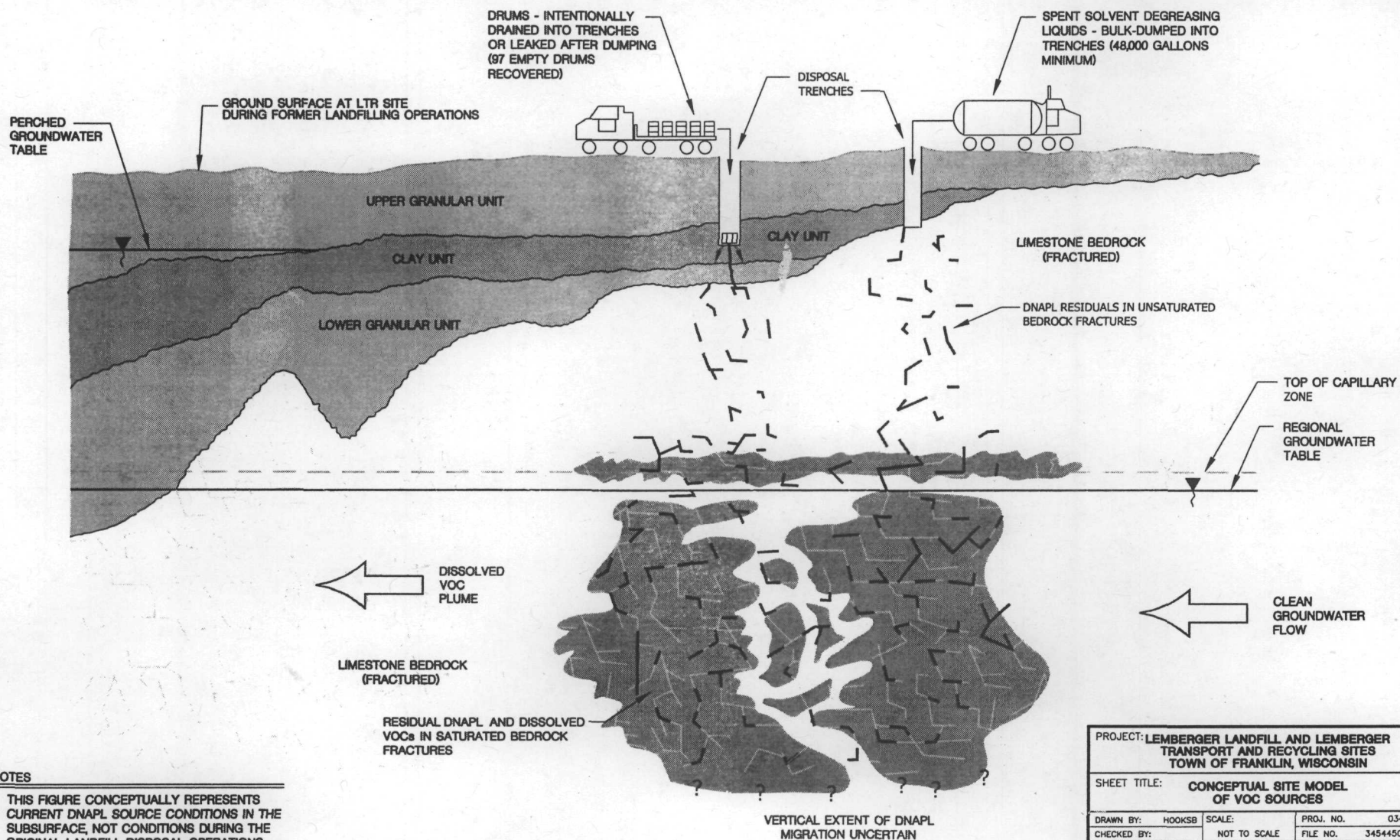


**LEGEND**

- GROUNDWATER MONITORING WELL
- GROUNDWATER OBSERVATION WELL
- GROUNDWATER COLLECTION SLUMP
- PIEZOMETRIC SURFACE CONTOUR (DASHED WHERE INTERPOLATED)
- - - WATER TABLE CONTOUR (DASHED WHERE INTERPOLATED)
- ← GROUNDWATER FLOW DIRECTION
- ROAD
- RIVER
- BUILDING
- FENCE

**NOTES**

1. BASE MAP AND WELL LOCATION INFORMATION WAS OBTAINED FROM A SURVEY PERFORMED BY LEMBERGER AND LEMBERGER INC. CONSULTING ENGINEERS AND LAND SURVEYORS ON DECEMBER 4, 1997.
2. STATE OF WISCONSIN SYSTEM IS BY AGREEMENT THAT THE TOWNSHIP SECTION CORNER OF SECTION 27, T24N, R08E HAS THE COORDINATES OF 18,000N AND 18,000E.
3. WHERE MULTIPLE WELLS ARE REPORTED, THE "1" WELL IS USED IN THE INTERPOLATION OF THE SURFACE PIEZOMETRIC SURFACE. WELLS 110, 112, 114, 116, 118, 120, 122, 124, 126, 128, 130, 132, 134, 136, 138, 140, 142, 144, 146, 148, 150, 152, 154, 156, 158, 160, 162, 164, 166, 168, 170, 172, 174, 176, 178, 180, 182, 184, 186, 188, 190, 192, 194, 196, 198, 200, 202, 204, 206, 208, 210, 212, 214, 216, 218, 220, 222, 224, 226, 228, 230, 232, 234, 236, 238, 240, 242, 244, 246, 248, 250, 252, 254, 256, 258, 260, 262, 264, 266, 268, 270, 272, 274, 276, 278, 280, 282, 284, 286, 288, 290, 292, 294, 296, 298, 300, 302, 304, 306, 308, 310, 312, 314, 316, 318, 320, 322, 324, 326, 328, 330, 332, 334, 336, 338, 340, 342, 344, 346, 348, 350, 352, 354, 356, 358, 360, 362, 364, 366, 368, 370, 372, 374, 376, 378, 380, 382, 384, 386, 388, 390, 392, 394, 396, 398, 400, 402, 404, 406, 408, 410, 412, 414, 416, 418, 420, 422, 424, 426, 428, 430, 432, 434, 436, 438, 440, 442, 444, 446, 448, 450, 452, 454, 456, 458, 460, 462, 464, 466, 468, 470, 472, 474, 476, 478, 480, 482, 484, 486, 488, 490, 492, 494, 496, 498, 500, 502, 504, 506, 508, 510, 512, 514, 516, 518, 520, 522, 524, 526, 528, 530, 532, 534, 536, 538, 540, 542, 544, 546, 548, 550, 552, 554, 556, 558, 560, 562, 564, 566, 568, 570, 572, 574, 576, 578, 580, 582, 584, 586, 588, 590, 592, 594, 596, 598, 600, 602, 604, 606, 608, 610, 612, 614, 616, 618, 620, 622, 624, 626, 628, 630, 632, 634, 636, 638, 640, 642, 644, 646, 648, 650, 652, 654, 656, 658, 660, 662, 664, 666, 668, 670, 672, 674, 676, 678, 680, 682, 684, 686, 688, 690, 692, 694, 696, 698, 700, 702, 704, 706, 708, 710, 712, 714, 716, 718, 720, 722, 724, 726, 728, 730, 732, 734, 736, 738, 740, 742, 744, 746, 748, 750, 752, 754, 756, 758, 760, 762, 764, 766, 768, 770, 772, 774, 776, 778, 780, 782, 784, 786, 788, 790, 792, 794, 796, 798, 800, 802, 804, 806, 808, 810, 812, 814, 816, 818, 820, 822, 824, 826, 828, 830, 832, 834, 836, 838, 840, 842, 844, 846, 848, 850, 852, 854, 856, 858, 860, 862, 864, 866, 868, 870, 872, 874, 876, 878, 880, 882, 884, 886, 888, 890, 892, 894, 896, 898, 900, 902, 904, 906, 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3248, 3250, 3252, 3254, 3256, 3258, 3260, 3262, 3264, 3266, 3268, 3270, 3272, 3274, 3276, 3278, 3280, 3282, 3284, 3286, 3288, 3290, 3292, 3294, 3296, 3298, 3300, 3302, 3304, 3306, 3308, 3310, 3312, 3314, 3316, 3318, 3320, 3322, 3324, 3326, 3328, 3330, 3332, 3334, 3336, 3338, 3340, 3342, 3344, 3346, 3348, 3350, 3352, 3354, 3356, 3358, 3360, 3362, 3364, 3366, 3368, 3370, 3372, 3374, 3376, 3378, 3380, 3382, 3384, 3386, 3388, 3390, 3392, 3394, 3396, 3398, 3400, 3402, 3404, 3406, 3408, 3410, 3412, 3414, 3416, 3418, 3420, 3422, 3424, 3426, 3428, 3430, 3432, 3434, 3436, 3438, 3440, 3442, 3444, 3446, 3448, 3450, 3452, 3454, 3456, 3458, 3460, 3462, 3464, 3466, 3468, 3470, 3472, 3474, 3476, 3478, 3480, 3482, 3484, 3486, 3488, 3490, 3492, 3494, 3496, 3498, 3500, 3502, 3504, 3506, 3508, 3510, 3512, 3514, 3516, 3518, 3520, 3522, 3524, 3526, 3528, 3530, 3532, 3534, 3536, 3538, 3540, 3542, 3544, 3546, 3548, 3550, 3552, 3554, 3556, 3558, 3560, 3562, 3564, 3566, 3568, 3570, 3572, 3574, 3576, 3578, 3580, 3582, 3584, 3586, 3588, 3590, 3592, 3594, 3596, 3598, 3600, 3602, 3604, 3606, 3608, 3610, 3612, 3614, 3616, 3618, 3620, 3622, 3624, 3626, 3628, 3630, 3632, 3634, 3636, 3638, 3640, 3642, 3644, 3646, 3648, 3650, 3652, 3654, 3656, 3658, 3660, 3662, 3664, 3666, 3668, 3670, 3672, 3674, 3676, 3678, 3680, 3682, 3684, 3686, 3688, 3690, 3692, 3694, 3696, 3698, 3700, 3702, 3704, 3706, 3708, 3710, 3712, 3714, 3716, 3718, 3720, 3722, 3724, 3726, 3728, 3730, 3732, 3734, 3736, 3738, 3740, 3742, 3744, 3746, 3748, 3750, 3752, 3754, 3756, 3758, 3760, 3762, 3764, 3766, 3768, 3770, 3772, 3774, 3776, 3778, 3780, 3782, 3784, 3786, 3788, 3790, 3792, 3794, 3796, 3798, 3800, 3802, 3804, 3806, 3808, 3810, 3812, 3814, 3816, 3818, 3820, 3822, 3824, 3826, 3828, 3830, 3832, 3834, 3836, 3838, 3840, 3842, 3844, 3846, 3848, 3850, 3852, 3854, 3856, 3858, 3860, 3862, 3864, 3866, 3868, 3870, 3872, 3874, 3876, 3878, 3880, 3882, 3884, 3886, 3888, 3890, 3892, 3894, 3896, 3898, 3900, 3902, 3904, 3906, 3908, 3910, 3912, 3914, 3916, 3918, 3920, 3922, 3924, 3926, 3928, 3930, 3932, 3934, 3936, 3938, 3940, 3942, 3944, 3946, 3948, 3950, 3952, 3954, 3956, 3958, 3960, 3962, 3964, 3966, 3968, 3970, 3972, 3974, 3976, 3978, 3980, 3982, 3984, 3986, 3988, 3990, 3992, 3994, 3996, 3998, 4000, 4002, 4004,



# NOTES

1. THIS FIGURE CONCEPTUALLY REPRESENTS CURRENT DNAPL SOURCE CONDITIONS IN THE SUBSURFACE, NOT CONDITIONS DURING THE ORIGINAL LANDFILL DISPOSAL OPERATIONS.
2. TIME REQUIRED FOR DNAPL TO MOVE FROM DISPOSAL TRENCHES INTO SATURATED BEDROCK AND BECOME IMMOBILIZED AFTER EACH DISPOSAL EVENT WAS LIKELY A FEW HOURS TO A FEW DAYS.

PROJECT: LEMBERGER LANDFILL AND LEMBERGER TRANSPORT AND RECYCLING SITES  
TOWN OF FRANKLIN, WISCONSIN

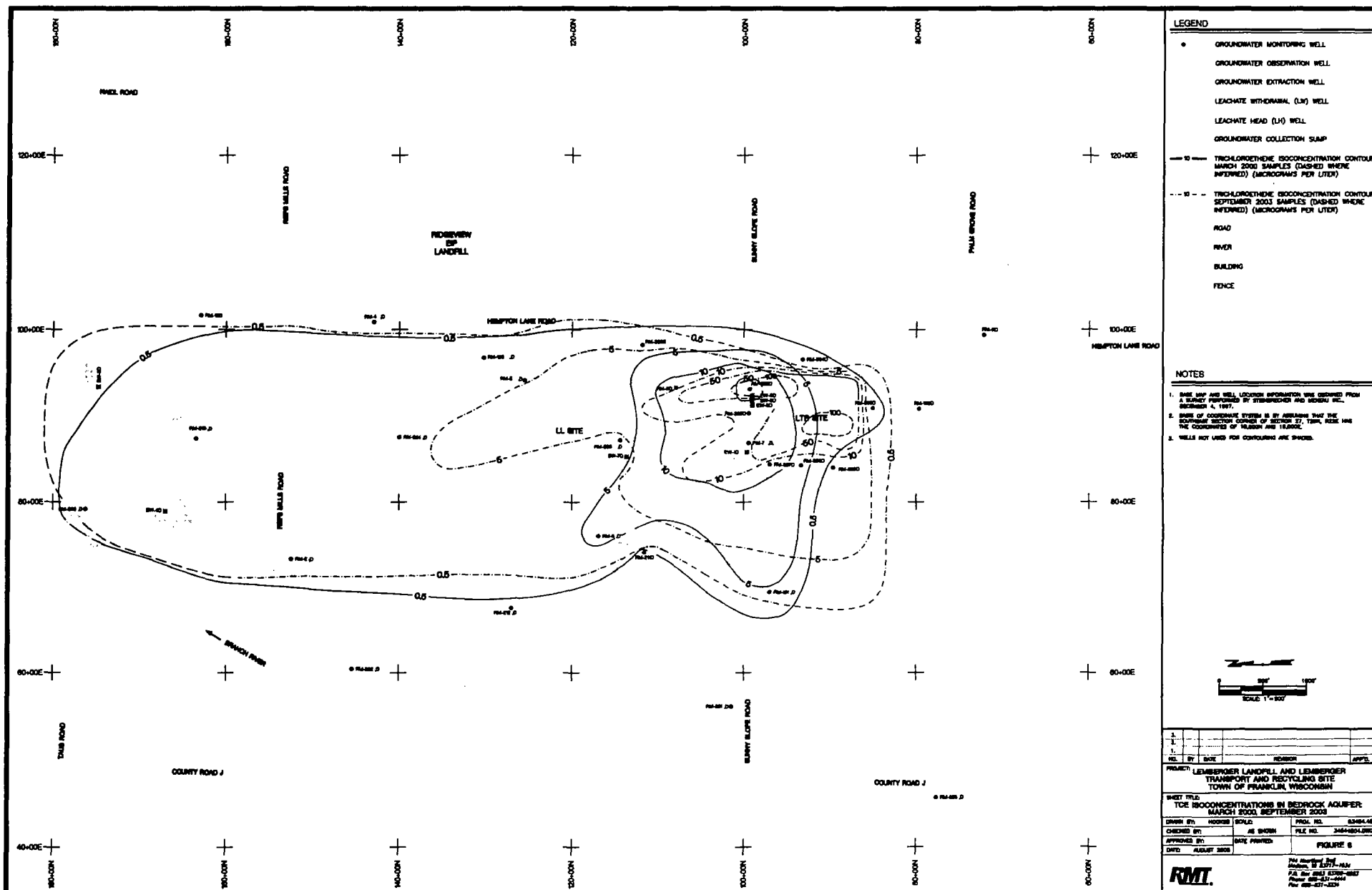
SHEET TITLE: CONCEPTUAL SITE MODEL  
OF VOC SOURCES

DRAWN BY: HOOKSB	SCALE: NOT TO SCALE	PROJ. NO. 03454.45
CHECKED BY:		FILE NO. 34544502.DWG
APPROVED BY:	DATE PRINTED:	FIGURE 5
DATE: AUGUST 2005		

**RMT**

744 Heartland Trail  
Madison, WI 53717-1934  
P.O. Box 8923 53708-8923  
Phone: 608-831-4444  
Fax: 608-831-3334

\$\$\$SCALE\$\$\$  
\$\$\$USER\$\$\$  
\$\$\$PROJ\$\$\$  
\$\$\$PLOT\$\$\$  
\$\$\$PLOTTER\$\$\$  
Attached Xref's: x



**State of Wisconsin  
Department of Natural Resources  
Remediation and Redevelopment Program**

**Mann-Kendall Statistical Test  
Form 4400-215 (2/2001)**

**Notice:** This form is the DNR supplied spreadsheet referenced in Appendices A of Comm 46 and NR 746, Wis. Adm. Code. It is provided to consultants as an optional tool for groundwater contaminant trend analysis to support site closure requests under s. Comm 46.07, Comm 46.08, NR 746.07, NR 746.08, Wis. Adm. Code. Use this form or a manual method when seeking case closure under those rules. Earlier versions of this form should not be used.

**Instructions:** Do not change formulas or other information in cells with a blue background, only cells with a yellow background are used for data entry. To use the spreadsheet, provide at least four rounds and not more than ten rounds of data that is not seasonally affected. Use consistent units. The spreadsheet contains several error checks, and a data entry error may cause "DATA ERR" or "DATE ERR" to be displayed. Dates that are not consecutive will show an error message and will not display the test results. The spreadsheet tests the data for both increasing and decreasing trends at both 80 percent and 90 percent confidence levels. If a declining trend is present at 80 percent but not at 90 percent, a site is still eligible for closure under Comm 46 and NR 746 provided that other conditions in those rules are met. If an increasing or decreasing trend is not present, an additional coefficient of variation test is used to test for stability, as proposed by Wiedemeier et al, 1999. For additional information, refer to the Interim Guidance on Natural Attenuation for Petroleum Releases, dated October 1999. Refer to the guidance for recommendations on data entry for non-detect values.

Site Name : Lemberger total VOC detects per well BRRTS No. = 02-36-000112/1 Well Number =

Compound ->		RM5D	204I	204D	208D	RM-2D	RM303D
		Concentration	Concentration	Concentration	Concentration	Concentration	Concentration
Event Number	Sampling Date (most recent last)	(leave blank if no data)	(leave blank if no data)	(leave blank if no data)	(leave blank if no data)	(leave blank if no data)	(leave blank if no data)
1	02-Dec-96	103.80	75.70	61.30	54.60	59.30	4,888.00
2	15-Sep-97	80.10	34.30	49.00	48.10	37.00	2,464.00
3	21-Sep-98	66.10	37.40	51.50	52.60	26.00	2,324.00
4	21-Sep-99	71.56	39.30	52.90	52.50	21.30	2,167.00
5	18-Jul-00	65.98	28.20	40.70	41.40	11.90	2,814.00
6	14-Mar-01	81.50	25.00	39.30	41.70	12.40	2,723.00
7	30-Mar-02	93.00	26.90	36.90	48.00	11.00	2,286.00
8	02-Apr-03	82.10	23.90	31.50	38.20		2,799.00
9	05-Dec-03	78.60	23.40	30.00	34.60		3,405.00
10	29-Nov-04	63.70	23.30	26.50	35.50		2,017.00
Mann Kendall Statistic (S) =		-9.0	-37.0	-39.0	-33.0	-19.0	-7.0
Number of Rounds (n) =		10	10	10	10	7	10
Average =		78.64	33.74	41.96	44.72	25.56	2788.70
Standard Deviation =		12.703	15.888	11.353	7.397	17.604	839.845
Coefficient of Variation(CV)=		0.162	0.471	0.271	0.165	0.689	0.301

**Error Check, Blank if No Errors Detected**

Trend ≥80% Confidence Level	No Trend	DECREASING	DECREASING	DECREASING	DECREASING	No Trend
Trend ≥90% Confidence Level	No Trend	DECREASING	DECREASING	DECREASING	DECREASING	No Trend
Stability Test, if No Trend Exists at 80% Confidence Level	CV ≤ 1 STABLE	NA	NA	NA	NA	CV ≤ 1 STABLE

Data Entry By = AWeissbach

Date = 30-Aug-05

Checked By =



**State of Wisconsin  
Department of Natural Resources  
Remediation and Redevelopment Program**

**Mann-Kendall Statistical Test  
Form 4400-215 (2/2001)**

**Notice:** This form is the DNR supplied spreadsheet referenced in Appendices A of Comm 46 and NR 746, Wis. Adm. Code. It is provided to consultants as an optional tool for groundwater contaminant trend analysis to support site closure requests under s. Comm 46.07, Comm 46.08, NR 746.07, NR 746.08, Wis. Adm. Code. Use this form or a manual method when seeking case closure under those rules. Earlier versions of this form should not be used.

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Site Name : Lemberger total VOC detects per well BRRTS No. = 02-36-000112/1 Well Number =

Event Number	Compound -> Sampling Date (most recent last)	306D Concentration (leave blank if no data)	306D TCA Concentration (leave blank if no data)	RM-7XD Concentration (leave blank if no data)	RM -7D Concentration (leave blank if no data)	RM-8D Concentration (leave blank if no data)	RM-7D TCE Concentration (leave blank if no data)
1	02-Dec-96	203.00	210.00	65.00	2,607.00	359.00	77.00
2	15-Sep-97	413.40	360.00	34.30	887.00	162.00	55.00
3	21-Sep-98	364.20	320.00	28.40	816.00	155.00	35.00
4	21-Sep-99	492.10	440.00	44.50	848.00	168.00	34.00
5	18-Jul-00	425.50	370.00	40.40	854.00	149.00	33.00
6	14-Mar-01	409.80	360.00	47.50	1,294.00	168.00	42.00
7	30-Mar-02	525.50	450.00	106.50	2,388.00	191.00	56.00
8	02-Apr-03	399.20	340.00	124.50	1,938.00	150.00	43.00
9	05-Dec-03	408.70	350.00	153.00	2,425.00	144.00	52.00
10	29-Nov-04	257.80	200.00	141.40	1,539.00	151.00	36.00
Mann Kendall Statistic (S) =		-1.0	-2.0	29.0	13.0	-16.0	-5.0
Number of Rounds (n) =		10	10	10	10	10	10
Average =		389.92	340.00	78.55	1559.60	179.70	46.30
Standard Deviation =		96.914	82.192	47.867	726.937	64.460	13.889
Coefficient of Variation(CV)=		0.249	0.242	0.609	0.466	0.359	0.300

Error Check, Blank if No Errors Detected

Trend ≥80% Confidence Level	No Trend	No Trend	INCREASING	INCREASING	DECREASING	No Trend
Trend ≥90% Confidence Level	No Trend	No Trend	INCREASING	No Trend	DECREASING	No Trend
Stability Test, If No Trend Exists at 80% Confidence Level	CV ≤ 1 STABLE	CV ≤ 1 STABLE	NA	NA	NA	CV ≤ 1 STABLE

Data Entry By = AWeissbach

Date = 30-Aug-05

Checked By =

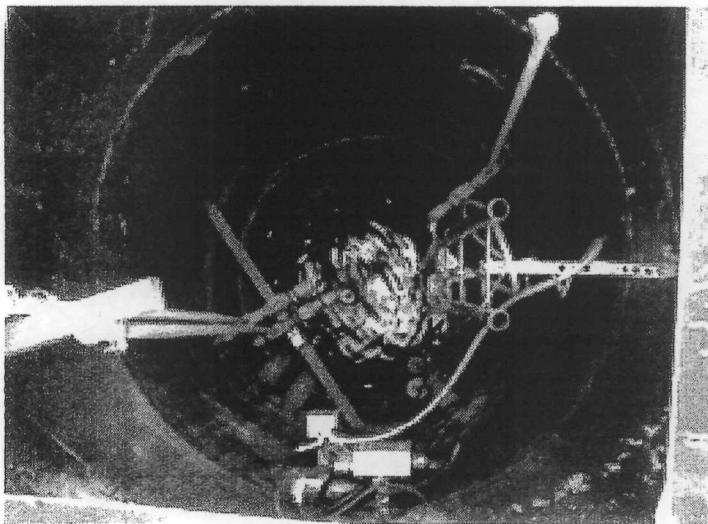




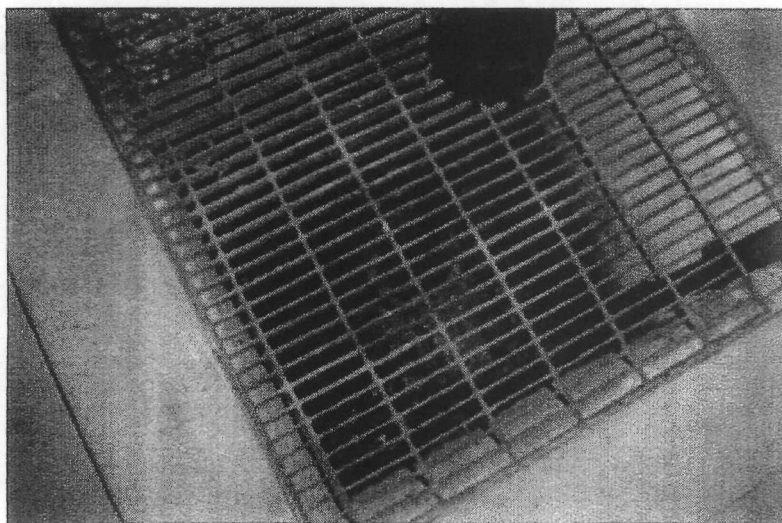
trees\_drainage LTR.JPG



trees\_drainage LTR2.JPG



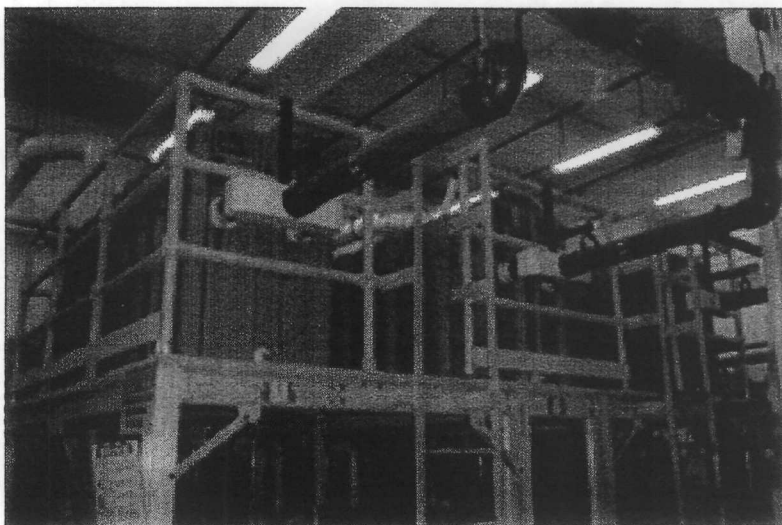
WW 101.JPG



aeration outflow tank .JPG



aeration tank bottom.JPG



aeration tank top.JPG



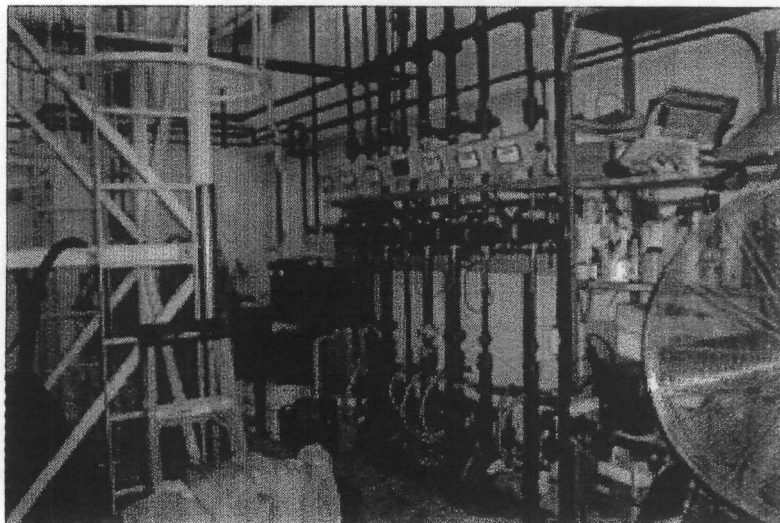
bedrock outcrop.JPG



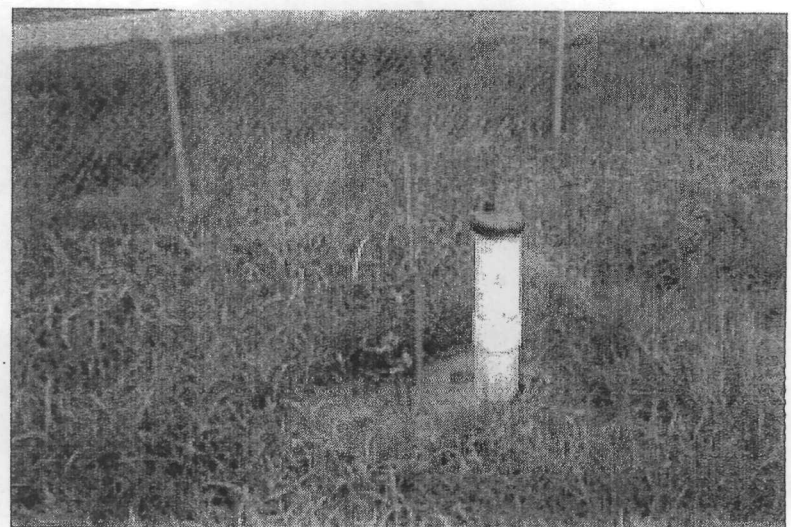
blower .JPG



drainage northwest LL.JPG

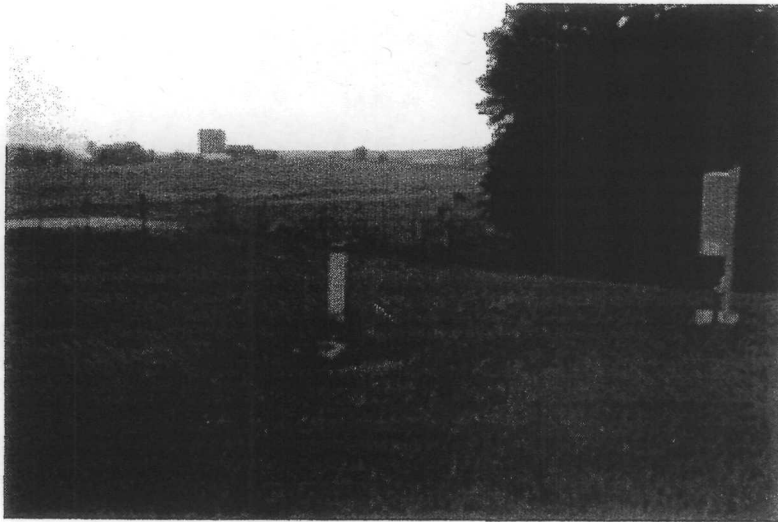


EW discharge in bldg .JPG

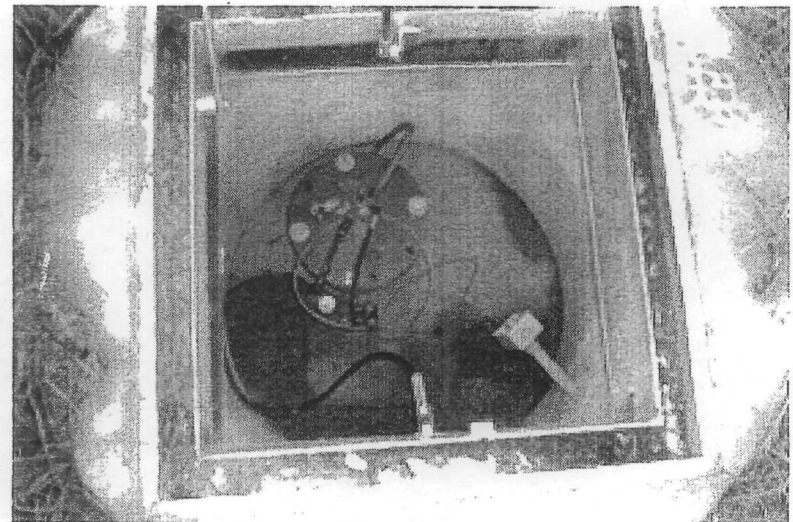


EW1D .JPG





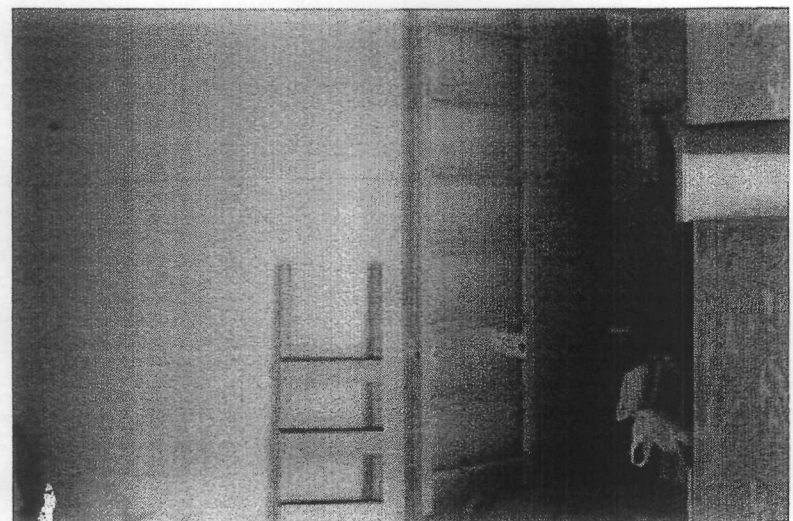
EW-8 .jpg



EW-8D.JPG



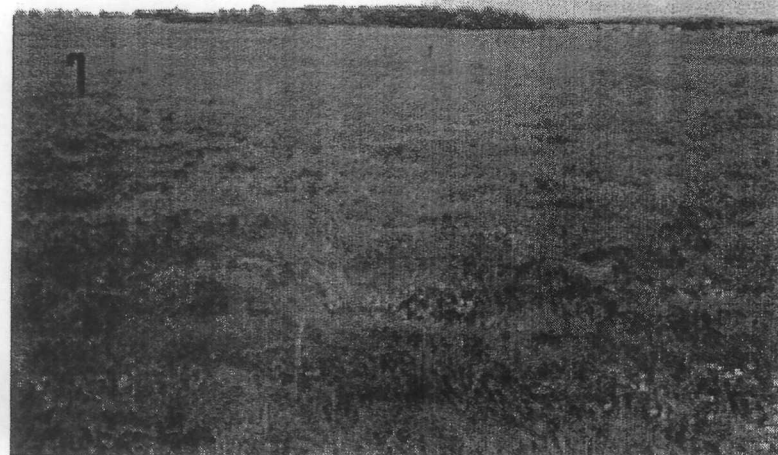
GV4 at LTR.JPG



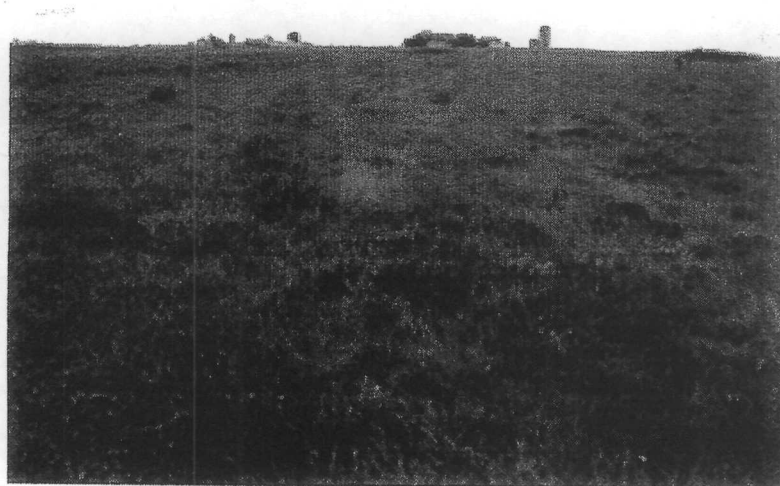
leachate tanks.JPG



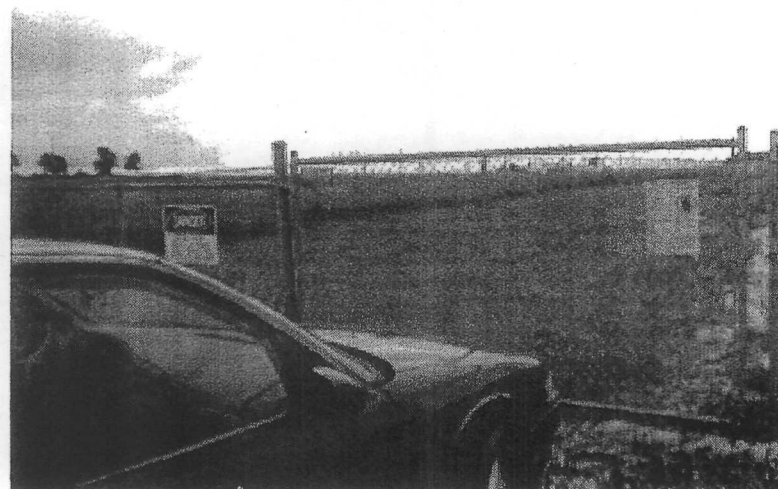
LTR1.JPG



LTR2.JPG



LTR3.JPG



signs at LTR .JPG

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

D-7

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency WDMR  
 Contact Annette Wastach Hydrogeologist 8/23/05 920 662 5165  
 Name Title Date Phone no.  
 Problems; suggestions; Report attached \_\_\_\_\_

Agency \_\_\_\_\_  
 Contact \_\_\_\_\_  
 Name Title Date Phone no.  
 Problems; suggestions; Report attached \_\_\_\_\_

Agency \_\_\_\_\_  
 Contact \_\_\_\_\_  
 Name Title Date Phone no.  
 Problems; suggestions; Report attached \_\_\_\_\_

Agency \_\_\_\_\_  
 Contact \_\_\_\_\_  
 Name Title Date Phone no.  
 Problems; suggestions; Report attached \_\_\_\_\_

4. **Other interviews (optional)** Report attached.

n/a

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)				
1.	<b>O&amp;M Documents</b> O&M manual ✓ As-built drawings Maintenance logs ✓ Remarks _____	<u>Readily available</u> <u>Readily available</u> <u>Readily available</u>	<u>Up to date</u> <u>Up to date</u> <u>Up to date</u>	N/A N/A N/A
2.	<b>Site-Specific Health and Safety Plan</b> Contingency plan/emergency response plan Remarks <u>not reviewed</u>	Readily available Readily available	Up to date Up to date	N/A N/A
3.	<b>O&amp;M and OSHA Training Records</b> Remarks <u>not reviewed</u>	Readily available	Up to date	N/A
4.	<b>Permits and Service Agreements</b> Air discharge permit Effluent discharge Waste disposal, POTW Other permits _____ Remarks _____	Readily available <u>Readily available</u> <u>Readily available</u> Readily available	Up to date <u>Up to date</u> <u>Up to date</u> Up to date	<u>N/A</u> N/A N/A N/A
5.	<b>Gas Generation Records</b> Remarks _____	Readily available	Up to date	<u>N/A</u>
6.	<b>Settlement Monument Records</b> Remarks _____	Readily available	Up to date	<u>N/A</u>
7.	<b>Groundwater Monitoring Records</b> Remarks _____	<u>Readily available</u>	<u>Up to date</u>	N/A
8.	<b>Leachate Extraction Records</b> Remarks _____	<u>Readily available</u>	<u>Up to date</u>	N/A
9.	<b>Discharge Compliance Records</b> Air Water (effluent) Remarks _____	<u>Readily available</u> <u>Readily available</u>	<u>Up to date</u> <u>Up to date</u>	N/A N/A
10.	<b>Daily Access/Security Logs</b> Remarks _____	<u>Readily available</u>	<u>Up to date</u>	N/A



IV. O&M COSTS																																															
1.	<b>O&amp;M Organization</b> State in-house _____ PRP in-house _____ Federal Facility in-house _____ Other <u>RMI, Inc</u>	Contractor for State _____ <u>Contractor for PRP</u> Contractor for Federal Facility _____																																													
2.	<b>O&amp;M Cost Records</b> Readily available <u>Up to date</u> Funding mechanism/agreement in place _____ Original O&M cost estimate _____ Breakdown attached _____  Total annual cost by year for review period if available  <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%;">From _____</td> <td style="width: 15%;">To <u>2000</u></td> <td style="width: 20%; text-align: center;"><u>535,000</u></td> <td style="width: 50%;">Breakdown attached</td> </tr> <tr> <td style="text-align: center;">Date</td> <td style="text-align: center;">Date</td> <td style="text-align: center;">Total cost</td> <td></td> </tr> <tr> <td>From _____</td> <td>To <u>2001</u></td> <td style="text-align: center;"><u>514,000</u></td> <td>Breakdown attached</td> </tr> <tr> <td style="text-align: center;">Date</td> <td style="text-align: center;">Date</td> <td style="text-align: center;">Total cost</td> <td></td> </tr> <tr> <td>From _____</td> <td>To <u>2002</u></td> <td style="text-align: center;"><u>569,000</u></td> <td>Breakdown attached</td> </tr> <tr> <td style="text-align: center;">Date</td> <td style="text-align: center;">Date</td> <td style="text-align: center;">Total cost</td> <td></td> </tr> <tr> <td>From _____</td> <td>To <u>2003</u></td> <td style="text-align: center;"><u>554,000</u></td> <td>Breakdown attached</td> </tr> <tr> <td style="text-align: center;">Date</td> <td style="text-align: center;">Date</td> <td style="text-align: center;">Total cost</td> <td></td> </tr> <tr> <td>From _____</td> <td>To <u>2004</u></td> <td style="text-align: center;"><u>448,000</u></td> <td>Breakdown attached</td> </tr> <tr> <td style="text-align: center;">Date</td> <td style="text-align: center;">Date</td> <td style="text-align: center;">Total cost</td> <td></td> </tr> <tr> <td colspan="2" style="text-align: center;"><u>Apr to July 2005</u></td> <td style="text-align: center;"><u>309,000</u></td> <td></td> </tr> </table>			From _____	To <u>2000</u>	<u>535,000</u>	Breakdown attached	Date	Date	Total cost		From _____	To <u>2001</u>	<u>514,000</u>	Breakdown attached	Date	Date	Total cost		From _____	To <u>2002</u>	<u>569,000</u>	Breakdown attached	Date	Date	Total cost		From _____	To <u>2003</u>	<u>554,000</u>	Breakdown attached	Date	Date	Total cost		From _____	To <u>2004</u>	<u>448,000</u>	Breakdown attached	Date	Date	Total cost		<u>Apr to July 2005</u>		<u>309,000</u>	
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Date	Date	Total cost																																													
<u>Apr to July 2005</u>		<u>309,000</u>																																													
3.	<b>Unanticipated or Unusually High O&amp;M Costs During Review Period</b> Describe costs and reasons: <u>Pipeline break at EW-2 Fall 2004</u> <u>Slidestope reconstruct 2003</u> _____ _____ _____																																														
V. ACCESS AND INSTITUTIONAL CONTROLS      Applicable      N/A																																															
<b>A. Fencing</b>																																															
1.	<b>Fencing damaged</b> Remarks <u>not</u>	Location shown on site map <u>Gates secured</u>	N/A																																												
<b>B. Other Access Restrictions</b>																																															
1.	<b>Signs and other security measures</b> Remarks <u>yellow and signs on gate (see photo)</u>																																														

C. Institutional Controls (ICs)				
1.	<b>Implementation and enforcement</b>			
	Site conditions imply ICs not properly implemented	Yes	No	N/A
	Site conditions imply ICs not being fully enforced	Yes	No	N/A
	Type of monitoring (e.g., self-reporting, drive by) _____			
	Frequency _____			
	Responsible party/agency _____			
	Contact _____			
	Name	Title	Date	Phone no.
	Reporting is up-to-date		Yes	No
	Reports are verified by the lead agency		Yes	No
	Specific requirements in deed or decision documents have been met		Yes	No
	Violations have been reported		Yes	No
	Other problems or suggestions:		Report attached	
	Need Retrospective ICs			
2.	<b>Adequacy</b>	ICs are adequate	ICs are inadequate	N/A
	Remarks	SEE narrative in report		
<b>D. General</b>				
1.	<b>Vandalism/trespassing</b>	Location shown on site map	No vandalism evident	
	Remarks	none		
2.	<b>Land use changes on site</b>	N/A		
	Remarks			
3.	<b>Land use changes off site</b>	N/A		
	Remarks	Additional residential housing construction		
<b>VI. GENERAL SITE CONDITIONS</b>				
<b>A. Roads</b>	Applicable	N/A		
1.	<b>Roads damaged</b>	Location shown on site map	Roads adequate	N/A
	Remarks	good driving condition		

<b>B. Other Site Conditions</b>			
Remarks LWB: more fill added near this location and berth and near RM208.			
<b>VII. LANDFILL COVERS</b> Applicable      N/A			
<b>A. Landfill Surface</b>			
1.	<b>Settlement</b> (Low spots) Areal extent _____ Depth _____ Remarks <u>minor settlement occurring, not a problem</u>	Location shown on site map _____ Settlement not evident	
2.	<b>Cracks</b> Lengths _____ Widths _____ Depths _____ Remarks _____	Location shown on site map _____ <u>Cracking not evident</u>	
3.	<b>Erosion</b> Areal extent _____ Depth _____ Remarks _____	Location shown on site map _____ <u>Erosion not evident</u>	
4.	<b>Holes</b> Areal extent _____ Depth _____ Remarks _____	Location shown on site map _____ <u>Holes not evident</u>	
5.	<b>Vegetative Cover</b> <u>Grass</u> Trees/Shrubs (indicate size and locations on a diagram) Remarks <u>mowed twice year</u>	<u>Cover properly established</u> No signs of stress	
6.	<b>Alternative Cover</b> (armored rock, concrete, etc.) Remarks _____	N/A	
7.	<b>Bulges</b> Areal extent _____ Height _____ Remarks _____	Location shown on site map _____ <u>Bulges not evident</u>	

8.	<b>Wet Areas/Water Damage</b>	<input checked="" type="checkbox"/> Wet areas/water damage not evident	
	Wet areas	Location shown on site map	Areal extent _____
	Ponding	Location shown on site map	Areal extent _____
	Seeps	Location shown on site map	Areal extent _____
	Soft subgrade	Location shown on site map	Areal extent _____
	Remarks <u>Dry Summer 2005, drainage slides on cover are adequate to provide surface water channeling</u>		
9.	<b>Slope Instability</b>	Slides	Location shown on site map <input checked="" type="checkbox"/> No evidence of slope instability
	Areal extent _____		
	Remarks _____		
<b>B. Benches</b> <input checked="" type="checkbox"/> Applicable N/A			
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)			
1.	<b>Flows Bypass Bench</b>	Location shown on site map	<input checked="" type="checkbox"/> N/A or okay
	Remarks _____		
2.	<b>Bench Breached</b>	Location shown on site map	<input checked="" type="checkbox"/> N/A or okay
	Remarks _____		
3.	<b>Bench Overtopped</b>	Location shown on site map	<input checked="" type="checkbox"/> N/A or okay
	Remarks _____		
<b>C. Letdown Channels</b> <input checked="" type="checkbox"/> Applicable N/A			
(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)			
1.	<b>Settlement</b>	Location shown on site map	<input checked="" type="checkbox"/> No evidence of settlement
	Areal extent _____	Depth _____	
	Remarks _____		
2.	<b>Material Degradation</b>	Location shown on site map	<input checked="" type="checkbox"/> No evidence of degradation
	Material type _____	Areal extent _____	
	Remarks _____		
3.	<b>Erosion</b>	Location shown on site map	<input checked="" type="checkbox"/> No evidence of erosion
	Areal extent _____	Depth _____	
	Remarks _____		

4.	<b>Undercutting</b>	Location shown on site map	<input checked="" type="checkbox"/> No evidence of undercutting
	Areal extent _____	Depth _____	
	Remarks _____		
5.	<b>Obstructions</b>	Type _____	<input checked="" type="checkbox"/> No obstructions
	Location shown on site map	Areal extent _____	
	Size _____		
	Remarks _____		
6.	<b>Excessive Vegetative Growth</b>	Type <u>Trees</u>	
	<del>No evidence of excessive growth</del> *		
	Vegetation in channels does not obstruct flow		
	Location shown on site map	Areal extent _____	
	Remarks <u>* trees growing in drainage areas (see photos)</u>		
	<u>will be cut this fall 2005</u>		
<b>D. Cover Penetrations</b>			
	Applicable	N/A	
1.	<b>Gas Vents</b>	Active	<input checked="" type="checkbox"/> Passive <u>LTR</u>
	<input checked="" type="checkbox"/> Properly secured/locked	Functioning	Routinely sampled <input checked="" type="checkbox"/> Good condition <input checked="" type="checkbox"/>
	Evidence of leakage at penetration		Needs Maintenance
	N/A		
	Remarks _____		
2.	<b>Gas Monitoring Probes</b> <u>LTR site</u>		
	<input checked="" type="checkbox"/> Properly secured/locked	Functioning	Routinely sampled <input checked="" type="checkbox"/> Good condition
	Evidence of leakage at penetration		Needs Maintenance N/A
	Remarks _____		
3.	<b>Monitoring Wells</b> (within surface area of landfill)		
	<input checked="" type="checkbox"/> Properly secured/locked	Functioning	Routinely sampled <input checked="" type="checkbox"/> Good condition
	Evidence of leakage at penetration		Needs Maintenance N/A
	Remarks _____		
4.	<b>Leachate Extraction Wells</b>		
	<input checked="" type="checkbox"/> Properly secured/locked	Functioning	Routinely sampled <input checked="" type="checkbox"/> Good condition
	Evidence of leakage at penetration		Needs Maintenance N/A
	Remarks <u>Leachate trucked to Kautawa - heart of the Valley</u>		
	<u>WWTP.</u>		
5.	<b>Settlement Monuments</b>	Located	Routinely surveyed <input checked="" type="checkbox"/> N/A
	Remarks _____		

<b>E. Gas Collection and Treatment</b>		Applicable	N/A
1.	<b>Gas Treatment Facilities</b> Flaring                      Thermal destruction                      Collection for reuse Good condition                      Needs Maintenance Remarks _____		
2.	<b>Gas Collection Wells, Manifolds and Piping</b> Good condition                      Needs Maintenance Remarks _____		
3.	<b>Gas Monitoring Facilities</b> (e.g., gas monitoring of adjacent homes or buildings) Good condition                      Needs Maintenance                      N/A Remarks _____		
<b>F. Cover Drainage Layer</b>		Applicable	N/A
1.	<b>Outlet Pipes Inspected</b> Remarks _____ Functioning		
2.	<b>Outlet Rock Inspected</b> Remarks <u>Trees need to be removed.</u> Functioning                      N/A		
<b>G. Detention/Sedimentation Ponds</b>		Applicable	N/A
1.	<b>Siltation</b> Areal extent _____ Depth _____ N/A Siltation not evident Remarks _____		
2.	<b>Erosion</b> Areal extent _____ Depth _____ <del>Erosion not evident</del> Remarks _____		
3.	<b>Outlet Works</b> Remarks _____ Functioning                      N/A		
4.	<b>Dam</b> Remarks _____ Functioning                      N/A		

<b>H. Retaining Walls</b>		Applicable	<u>N/A</u>
1.	<b>Deformations</b> Horizontal displacement _____ Rotational displacement _____ Remarks _____	Location shown on site map	Deformation not evident
2.	<b>Degradation</b> Remarks _____	Location shown on site map	Degradation not evident
<b>I. Perimeter Ditches/Off-Site Discharge</b>		Applicable	N/A
1.	<b>Siltation</b> Areal extent _____ Remarks _____	Location shown on site map	Siltation not evident ✓
2.	<b>Vegetative Growth</b> Vegetation does not impede flow Areal extent _____ Remarks <u>Trees under the ditch to be cut this fall</u>	Location shown on site map	N/A
3.	<b>Erosion</b> Areal extent _____ Remarks _____	Location shown on site map	✓ Erosion not evident
4.	<b>Discharge Structure</b> Remarks _____	<u>Functioning</u>	N/A
<b>VIII. VERTICAL BARRIER WALLS</b>		Applicable	<u>N/A</u>
1.	<b>Settlement</b> Areal extent _____ Remarks _____	Location shown on site map	Settlement not evident
2.	<b>Performance Monitoring</b> Type of monitoring _____ Performance not monitored Frequency _____ Head differential _____ Remarks _____		Evidence of breaching

<b>IX. GROUNDWATER/SURFACE WATER REMEDIES</b>		<u>Applicable</u>	N/A
<b>A. Groundwater Extraction Wells, Pumps, and Pipelines</b>		<u>Applicable</u>	N/A
1.	<b>Pumps, Wellhead Plumbing, and Electrical</b> <input checked="" type="checkbox"/> Good condition      All required wells properly operating      Needs Maintenance      N/A Remarks <u>EWH metering not accurate</u>		
2.	<b>Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances</b> <input checked="" type="checkbox"/> Good condition      Needs Maintenance Remarks		
3.	<b>Spare Parts and Equipment</b> Readily available      Good condition      Requires upgrade      Needs to be provided Remarks <u>Did not see</u>		
<b>B. Surface Water Collection Structures, Pumps, and Pipelines</b>		Applicable	<u>N/A</u>
1.	<b>Collection Structures, Pumps, and Electrical</b> Good condition      Needs Maintenance Remarks		
2.	<b>Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances</b> Good condition      Needs Maintenance Remarks		
3.	<b>Spare Parts and Equipment</b> Readily available      Good condition      Requires upgrade      Needs to be provided Remarks		



C. Treatment System		Applicable	N/A
1.	<b>Treatment Train</b> (Check components that apply) Metals removal _____ Oil/water separation _____ Bioremediation _____ Air stripping <input checked="" type="checkbox"/> _____ Carbon adsorbers _____ Filters _____ Additive (e.g., chelation agent, flocculent) _____ Others _____ Good condition <input checked="" type="checkbox"/> _____ Needs Maintenance _____ Sampling ports properly marked and functional _____ Sampling/maintenance log displayed and up to date _____ Equipment properly identified _____ Quantity of groundwater treated annually <u>~100,000,000</u> Quantity of surface water treated annually <u>—</u> Remarks <u>IL dewatering/Leachate collection ~60,000 gallons/month</u>		
2.	<b>Electrical Enclosures and Panels</b> (properly rated and functional) N/A _____ <input checked="" type="checkbox"/> Good condition _____ Needs Maintenance _____ Remarks _____		
3.	<b>Tanks, Vaults, Storage Vessels</b> ( <u>Leachate</u> ) N/A _____ <input checked="" type="checkbox"/> Good condition _____ <input checked="" type="checkbox"/> Proper secondary containment _____ Needs Maintenance _____ Remarks _____		
4.	<b>Discharge Structure and Appurtenances</b> N/A _____ Good condition _____ Needs Maintenance _____ Remarks _____		
5.	<b>Treatment Building(s)</b> <input checked="" type="checkbox"/> N/A _____ <input checked="" type="checkbox"/> Good condition (esp. roof and doorways) _____ Needs repair _____ Chemicals and equipment properly stored _____ Remarks _____		
6.	<b>Monitoring Wells</b> (pump and treatment remedy) <input checked="" type="checkbox"/> Properly secured/locked <input checked="" type="checkbox"/> Functioning <input checked="" type="checkbox"/> Routinely sampled <input checked="" type="checkbox"/> Good condition _____ All required wells located _____ Needs Maintenance _____ N/A _____ Remarks _____		
<b>D. Monitoring Data</b>			
1.	<b>Monitoring Data</b> <input checked="" type="checkbox"/> Is routinely submitted on time _____ Is of acceptable quality _____		
2.	<b>Monitoring data suggests:</b> <input checked="" type="checkbox"/> Groundwater plume is effectively contained _____ Contaminant concentrations are declining _____		

<b>D. Monitored Natural Attenuation</b>			
1.	<b>Monitoring Wells</b> (natural attenuation remedy)		
	Properly secured/locked	Functioning	Routinely sampled
	All required wells located	Needs Maintenance	Good condition
Remarks			N/A
<b>X. OTHER REMEDIES</b>			
If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.			
<b>XI. OVERALL OBSERVATIONS</b>			
<b>A. Implementation of the Remedy</b>			
Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).			
<p>please see narrative in five-year report Sep 2005</p>			
<b>B. Adequacy of O&amp;M</b>			
Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.			
<p>O&amp;M procedures at site are very adequate and properly maintained</p>			

**C. Early Indicators of Potential Remedy Problems**

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

please see narrative on five-year report Sept 05

**D. Opportunities for Optimization**

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

n/a